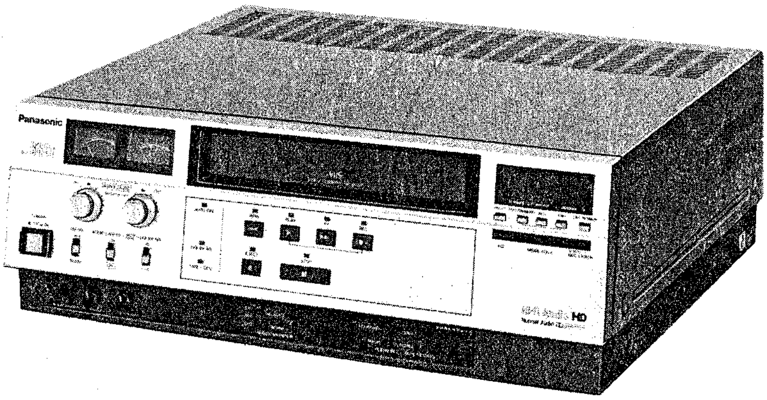
ORDER NO. VRD-8310-493

Service Manual

Video Cassette Recorder

Panasonic
Omnivision II VHS Hi-Fi

AG-6800



Vol. 1	Vol. 2	Vol. 3	Vol. 4	Vol. 5
Operating Instructions *Circuit Descriptions*	*Mechanical Adjustment Procedures* *Electrical Adjustment Procedures*	*Block Diagrams*	*Schematic Diagrams* *Circuit Board Diagrams*	*Exploded Views* *Replacement Parts Lists*

VHS Hi-Fi

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Panasonic®

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Vol. 1

Operating Instructions
Circuit Descriptions

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Introduction

This Service Manual contains technical information which will allow service technicians to understand and service the high performance 1/2" Hi-Fi video cassette Recorder Model AG-6800.
The Panasonic AG-6800 Hi-Fi video cassette Recorder is especially designed for "Hi-Fi" sound dubbing with see-through front loading full logic control loop through recording for dubbing through REC REMOTE connectors which can be connected 500 units with 19" rack and mode lock function.
These features in addition to the basic NTSC VHS Format make the unit an ideal one for your education, recreation and entertainment.

Just slightly ahead of our time .... Panasonic

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SPECIFICATIONS

Power Source:	110/120/220/240V AC, 60/50Hz
Power Consumption:	Approx. 60 watts
Television System:	EIA Standard (525 lines, 60 fields) NTSC color signal
Video Recording System:	2 rotary heads, helical scanning system Luminance: FM azimuth recording Color signal: converted subcarrier phase shift recording
Audio Tracks:	4 channels NORMAL (CH1/CH2): 2 fixed head tracks HD (CH1/CH2): 2 rotary head tracks
Tape Format:	Tape width 1/2 inch (12.7mm), high density tape
Tape Speed:	1-5/16 i.p.s. (33.35mm/s) (Normal)
Record/Playback Time:	120min. with NV-T120
FF/REW Time:	Less than 4.0min with NV-T120
Input Level:	Video: VIDEO IN (BNC), 1.0Vp-p, 75Ω Audio: LINE IN (RCA); NORMAL (CH1/CH2) −20dB (standard input −8dB), 47kΩ HD (CH1/CH2)
Output Level:	Video: TV Monitor (8 pins), 1.0Vp-p, 75Ω VIDEO OUT (BNC), 1.0Vp-p, 75Ω Audio: TV Monitor (8 pins), 0dB, 600Ω AUDIO OUT (RCA); NORMAL (CH1/CH2) −8dB, 1kΩ HD (CH1/CH2) HEADPHONES, −16dB ~ −60dB, 8Ω

Rec Remote:	(RCA)
Camera Remote:	(M2)
Video Horizontal Resolution:	Color: more than 240 lines B/W: more than 300 lines (on monoscope test pattern)
Audio Frequency Response:	50 ~ 12,000Hz (Normal Audio) 20 ~ 20,000Hz (HD Sound)
Signal-to-Noise Ratio:	Video: B/W: better than 46dB Color: better than 45dB (Shibasoku noise meter) Audio: better than 48dB (Normal Audio/ Dolby NR IN)
Audio Dynamic Range:	better than 80dB (HD Sound)
Wow and Flutter:	less than 0.005% (HD Sound)
Operating Temperature:	41°F ~ 104°F (5°C ~ 40°C)
Operating Humidity:	35% ~ 80%
Weight:	30.9 lbs (14.0kg)
Dimensions:	17″(W) × 15-1/2″(D) × 6-1/4″(H) 430(W) × 392(D) × 158(H)mm
Accessory Supplied:	1 pc. Dust cover

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

* Noise reduction manufactured under license from Dolby Laboratories Licencing Corporation.

Features

1. FM audio recording (HD sound)

The FM recording system records an audio signal that has been converted to a wide-band FM signal on tape.
HD sound recordings use 2 rotating heads exclusively for audio recording.
This makes it possible to obtain sound recordings that are superior in frequency characteristics, wow and flutter, and dynamic range to normal audio recordings made with fixed heads.
(HD sound is an abbreviation of High Dynamic sound).

2. Series recording (special for dubbing use)

By providing an on/off type remote control box, it is possible to do series recording from a Master VTR onto a maximum of 500 AG-6800 units (connected in series) at one time. In this series recording, with the remote control box from ON to OFF, the following operations can be performed by means of adjustments inside the main unit.
If you wish to have these adjustments made please consult refer 34 pin microcomputer section.

A. The VTR can be stopped automatically during recording.
B. The VTR can be temporarily stopped automatically during recording.
C. During recording the tape can be rewound to the beginning, the VTR stopped and the tape automatically removed.
D. During recording the VTR can be stopped and the tape automatically removed.

3. Audio input and output jacks for normal audio and HD sound

There are independent input and output jacks for normal sound and HD sound on the rear panel.
An audio input signal that is connected to the normal audio input jack is automatically connected though to the HD sound input jack.

Other characteristics

- An audio limiter circuit is built in (only for the normal audio). During normal audio recording, the limiter circuit acts on excessively loud input.
- A Dolby NR*B system is built in for normal audio.
- Meters are included for use in adjusting the audio recording volume.
- Automatic rewind mechanism: when the end of the tape is reached, the tape is automatically rewound to the beginning.
- Mode lock switching with indicator lamp: when one button is being operated, other buttons become inoperative.
- There is a connecting jack for time code signal use.
- There is a recording remote control error indicator.
- There is a recording remote control error indicator.
- Elapsed time can be indicated on a remote control unit which includes a counter.
- There is an indicator showing how much tape is left.
- There is a headphone volume adjustment.
- It is possible to see the tape directly by the mirror in the front loading mechanism.
- The unit is front loading.
- There is an hour meter.
- There is a fan motor.
- The units can be stored on an EIA standard 19-inch rack.
- There is a jack for remote camera control.
- HD sound recording "ON/OFF" selectability.

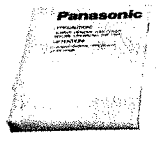
*'Dolby' and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.

Inspection

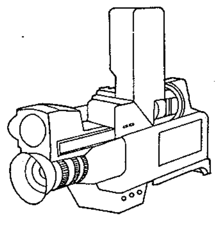
CAUTION:
TO PREVENT FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.

Standard Accessories

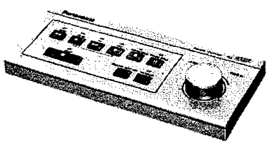
After removing the unit from its box, check to be sure it has not sustained any damage. Also check to see that you have the following accessory as pictured below.

Dust Cover	Part No.	
	VFB0043	1 pc.

Optional Accessories



Color Video
Camera WV-3230

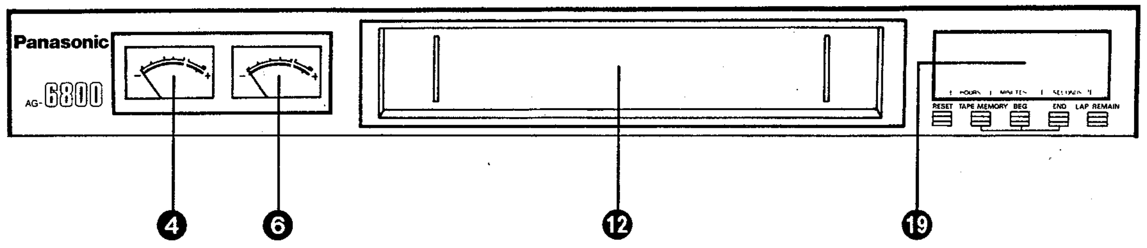


Remote Controller
AG-A600

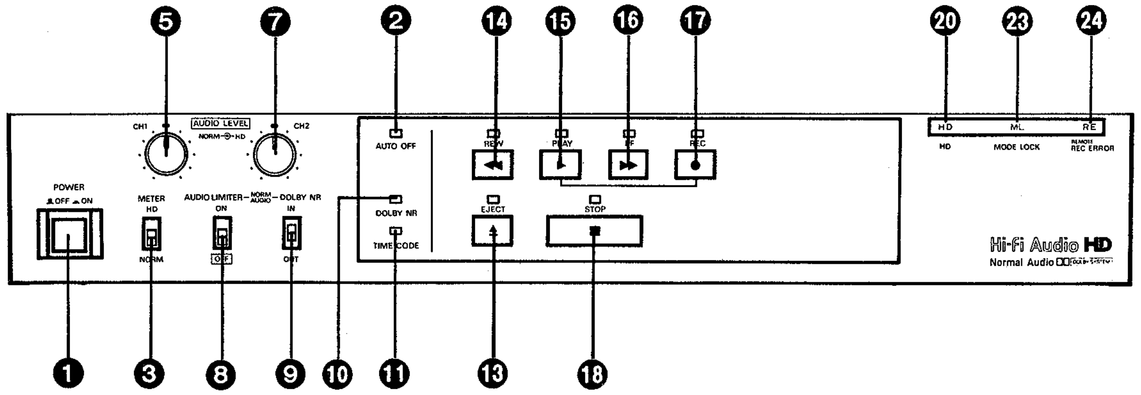
Regarding Rack Mounting:
Use optional Rack-mounting Frame AG-M600.
When mounting the VTR in a rack, be sure to install a fan for heat dissipation on the rack before using.
For details, please consult your Panasonic service personnel.

Controls and Indicators

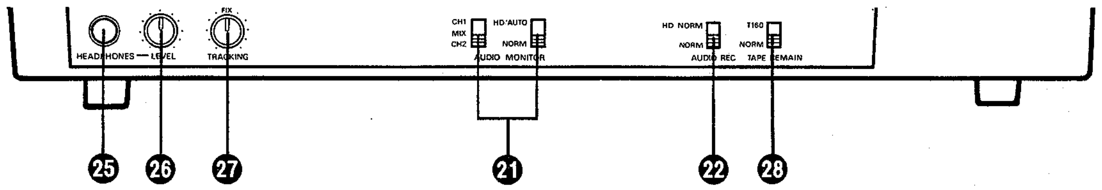
Upper Panel


Panasonic
AG-6800
HOURS MINUTES SECONDS
RESET TAPE MEMORY BEG END LAP REMAIN
④
⑥
⑫
⑲

Middle Panel


⑤
⑦
②
⑭
⑮
⑯
⑰
⑳
㉓
㉔
CH1
AUDIO LEVEL
NORM HD
CH2
POWER
OFF ON
METER
HD
NORM
AUDIO LIMITER
NORM AUDIO
DOLBY NR
ON
OFF
IN
OFF
AUTO OFF
DOLBY NR
TIME CODE
REW
PLAY
FF
REC
EJECT
STOP
HD
ML
RE
HD
MODE LOCK
REMAIN REC ERROR
Hi-Fi Audio HD
Normal Audio
①
③
⑧
⑨
⑩
⑪
⑬
⑱

Lower Panel


HEADPHONES — LEVEL
FIX
TRACKING
CH1
MIX
CH2
HD AUTO
NORM
AUDIO MONITOR
HD NORM
NORM
AUDIO REC
T160
NORM
TAPE REMAIN
㉕
㉖
㉗
㉑
㉒
㉘

Power Section (Middle Panel)

① **Power Switch [POWER]**
Power is supplied to the unit when this switch is activated. The audio CH 1, CH 2 meter and eject lamps light. The tape counter illuminates, and the tape is set to intermediate loading position. When the switch is pushed again, the power is switched off.

② **Auto OFF Lamp [AUTO OFF]**
This lamp lights when condensation has formed inside the unit, which cause the unit to cease operating. The cassette tape will be ejected automatically. It flashes when something is wrong with the tape transport (such as tape slack). The unit does not operate when this lamp is either lit or flashing. (Power Switch ① will not apply power).

Audio Section (Middle/Lower Panels)

③ **Meter Selector [METER]**
This is the audio level meter selection switch.

HD: Use when adjusting the HD sound recording input level.

NORM: Use when adjusting the normal audio recording input level.

④ **Audio Channel 1 Level Meter**
This is the audio channel 1 peak level meter.
Adjust channel 1 level control ⑤ so that the meter needle does not cross 0dB.

⑤ **Audio Channel 1 Level Control**
The inside knob is the level control knob for normal audio, and the outside is for HD sound. When using normal input the control is normally set at the click stop. To adjust the normal audio level, set the Audio Limiter ⑧ to "OFF" and then adjust this control so that Level Meter ④ does not cross 0dB.

⑥ **Audio Channel 2 Level Meter**
The operation of this is the same as described for channel 1 in ④.

⑦ **Audio Channel 2 Level Control**
The operation of this is the same as that for channel 1 described in ⑤.

⑧ **Audio Limiter Selector [AUDIO LIMITER]**
This selector only works during normal audio recording.

ON: When loud instantaneous noises are entering the audio input, set the audio limiter selector switch to this position. The audio limiter circuit will then operate to maintain distortion-free recording.

OFF: The sound is recorded just as it enters. Since the limiter does not operate to limit unusually loud noises, it is necessary to set the audio level low.

⑨ **Dolby NR Switch [DOLBY NR]**
This only works during normal audio recording. When the Dolby NR Switch is set to the "IN" position, Dolby NR System is activated.

⑩ **Dolby NR Lamp**
When the Dolby NR Switch is in the "IN" position, this lamp is illuminated and the Dolby Noise-Reduction System is enabled.

⑪ **Time Code Lamp [TIME CODE]**
When the Audio CH 2 Selector Switch ㊷ on the rear panel is set to TIME CODE, this lamp lights.

Operating Buttons Section (Upper/Middle Panels)

⑫ **Cassette Holder**

⑬ **Eject Button/Lamp [EJECT]**
To remove a cassette, press this button.
If this button is pressed while the tape is moving, (during playback, fast forward or rewind) the unit will stop and then eject the cassette tape.

⑭ **Rewind Button/Lamp [REW]**
When this button is pressed, the cassette tape is rewound to the supply reel.

⑮ **Play Button/Lamp [PLAY]**
Pressing this button causes the tape to start playback. If Record Button is held down first, and then this button is pressed, the unit will go into the recording mode.

⑯ **Fast Forward Button/Lamp [FF]**
When this button is pressed, the tape is wound rapidly onto the takeup reel.

⑰ **Record Button/Lamp [REC]**
This button should be pressed and held in while Play Button is pressed to start recording both video and audio.

⑱ **Stop Button/Lamp [STOP]**
Used to stop the tape movement.

Tape Counter Section (Upper Panel)

⑲ **Tape Counter**

⊡ :	indicates that the cassette is in the cassette holder.
▬ :	indicates the minus counter position "-*:**:**" when the tape is rewound beyond the reset (0:00:00) position.
000:	indicates the counter (0:00:00) search mode by pressing the Rewind or Fast Forward Button.
↻ :	indicates the one-time repeated playback mode.
⟲ :	indicates the random repeated playback mode.
BEG:	indicates the program start position which is to be repeated.
END:	indicates the program end position which is to be repeated.

LAP:

REM
RES
Bu
TAP
But

BEG

END

LAP

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HD
wil
- HD
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㉒ Auc
HD/
NOF

General Introduction

The Panasonic VHS Model AG-6800 VTR is designed for "Hi-Fi" sound recording and tape duplication. For tape duplication, up to 500 units can be accommodated in a loop-through connection using the REC REMOTE Connectors. Other features include see-through frontloading, full logic control, and mode lock function.

The "Hi-Fi" sound recording system converts amplitude modulation (AM) signals into frequency modulation (FM) signals and records them onto the video track through 2 special audio heads mounted on the video head cylinder.

This results in High-Fidelity stereo sound with a wide dynamic range (80 dB), an extended frequency response range of 20Hz - 20,000Hz, and a wow & flutter value that is an excellent 0.005% or less.

Let's introduce "VHS Hi-Fi" system more detail.
It is achieved by three new systems namely Depth Multiplex Recording system, FM modulated audio signal recording system and a newly developed noise reduction system.

---

1. Rotary Audio Heads and the Depth Multiplex Recording System

   The new Audio Heads, AL and AR, are installed on the upper cylinder as shown in Figure 1. The rotating heads result in a sharply increased relative tape speed of about 170 times the normal audio recording speed of 33.35mm/sec. with stationary heads. The Audio Heads AL and AR, are separated by 120° from the video heads, and at a height 50 micrometers above the video head height. Figure 2 shows this and other characteristics of the Heads.

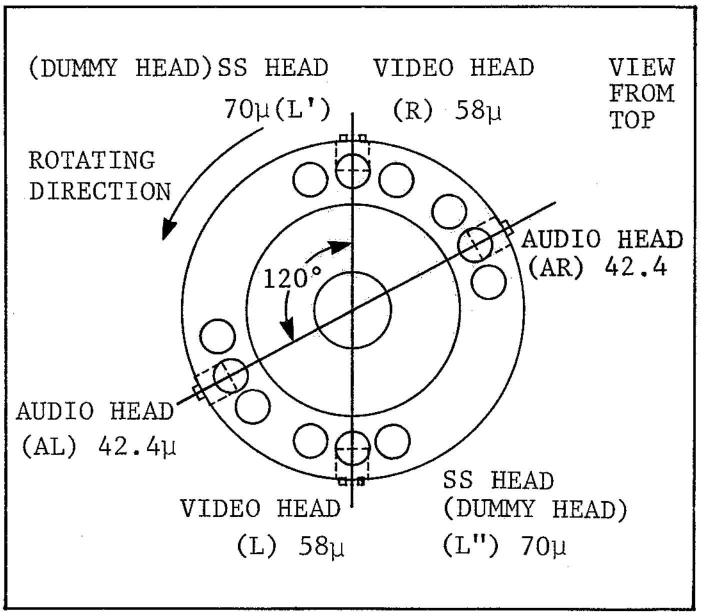

(DUMMY HEAD) SS HEAD
70µ(L')
VIDEO HEAD
(R) 58µ
VIEW FROM TOP
ROTATING DIRECTION
120°
AUDIO HEAD
(AR) 42.4
AUDIO HEAD
(AL) 42.4µ
VIDEO HEAD
(L) 58µ
SS HEAD
(DUMMY HEAD)
(L") 70µ

Figure 1. Rotary Audio Head

NOTE: SS HEADS are used only for normal Tape Pass.
These Heads are not used for STILL and Slow modes.

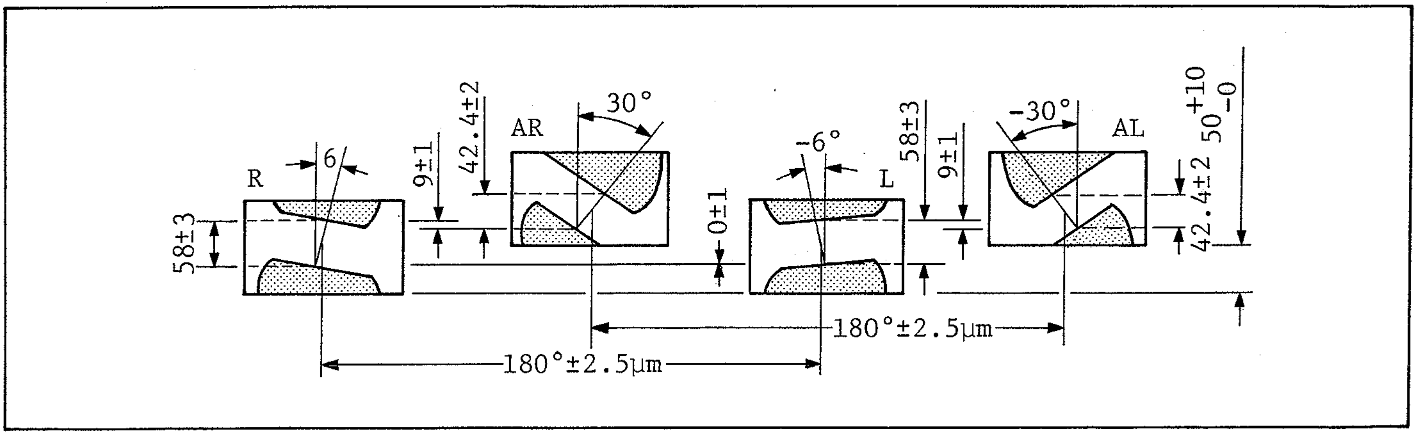

R
6°
58±3
9±1
42.4±2
AR
30°
0±1
-6°
L
58±3
9±1
-30°
AL
50 +10 -0
42.4±2
180°±2.5µm
180°±2.5µm

Figure 2. Audio and video Heads Height, Azimuth Angles, and Gaps

Azimuth angles are -30° and +30° for AL and AR respectively. In addition, the Audio Head gaps are about 3 times as wide as the Video Head gaps. Using these new heads, audio signals can be recorded by AL head (-30°) on the deep layer of the magnetic substance of the tape first, followed by video signals that are recorded by R head (+6°) on the surface of the magnetic substance of the tape, as shown in Figure 3 and Figure 4. This system, that records both the audio and video signals on the tape in double layers, is called a "Depth Multiplex" system.

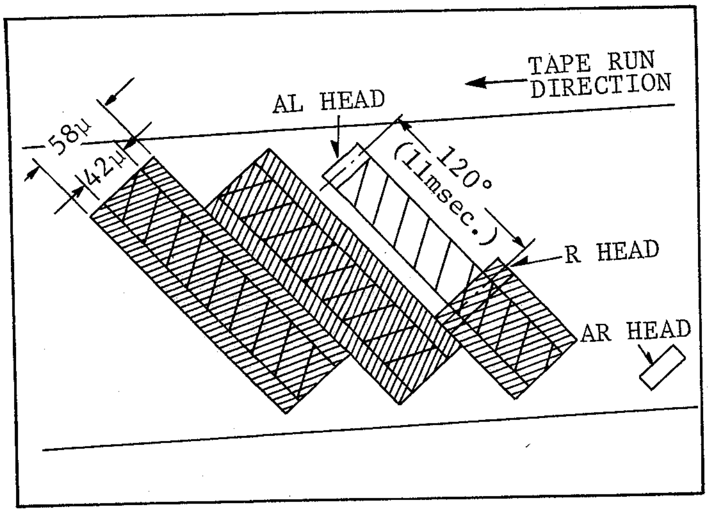

58μ
42μ
AL HEAD
TAPE RUN DIRECTION
120° (11msec.)
R HEAD
AR HEAD

Figure 3. Audio and Video Signals Recorded Tape Pattern

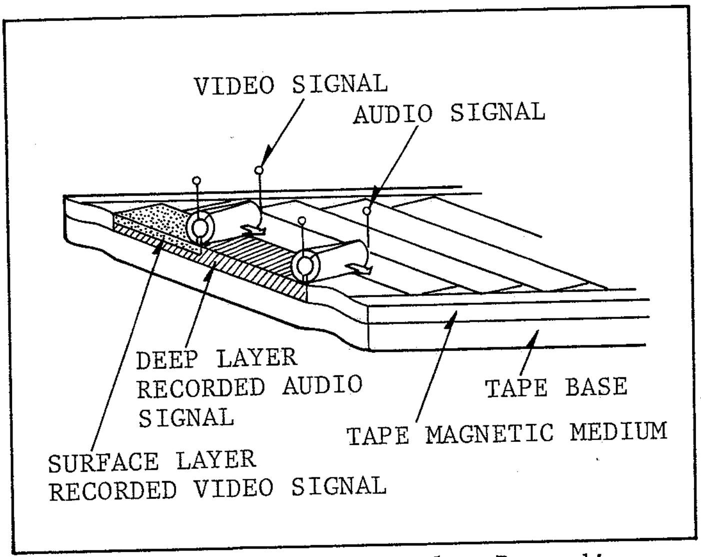

VIDEO SIGNAL
AUDIO SIGNAL
DEEP LAYER RECORDED AUDIO SIGNAL
TAPE BASE
TAPE MAGNETIC MEDIUM
SURFACE LAYER RECORDED VIDEO SIGNAL

Figure 4. Depth Multiplex Recording

2. FM Modulation Audio Recording System

The audio signal for the left channel will be FM modulated onto a 1.3MHz carrier, while the right channel will be FM modulated a 1.7MHz carrier. Each channel uses a frequency deviation of ±150kHz. (Figure 5 shows the position of the FM audio signal on the total signal spectrum.)

This results in a significantly improved S/N ratio and effectively prevents possible interference from the video signals.

3. Newly Developed Noise Reduction System

Noise reduction in the AG-6800 is achieved by a newly developed system called Noise Reduction System. This system differs from the more widely known Dolby System, and operates as follows:
The dynamic range of the input signal is compressed to 1/2 its original level and then recorded. The recorded signal is then expanded prior to playback in order to restore it to the original level.
Figure 6 shows how this process effectively results in a 80 dB. dynamic range, and places the tape saturation and tape hiss noise regions outside of the playback audio range.

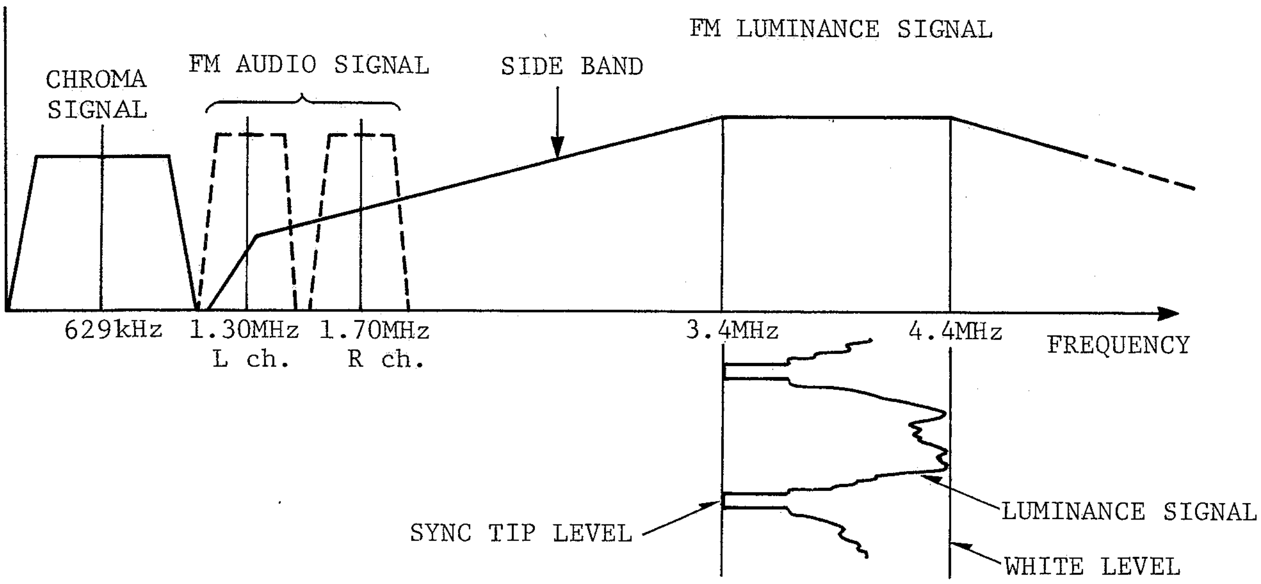


Figure 5. Hi-Fi VHS Signal Spectrum

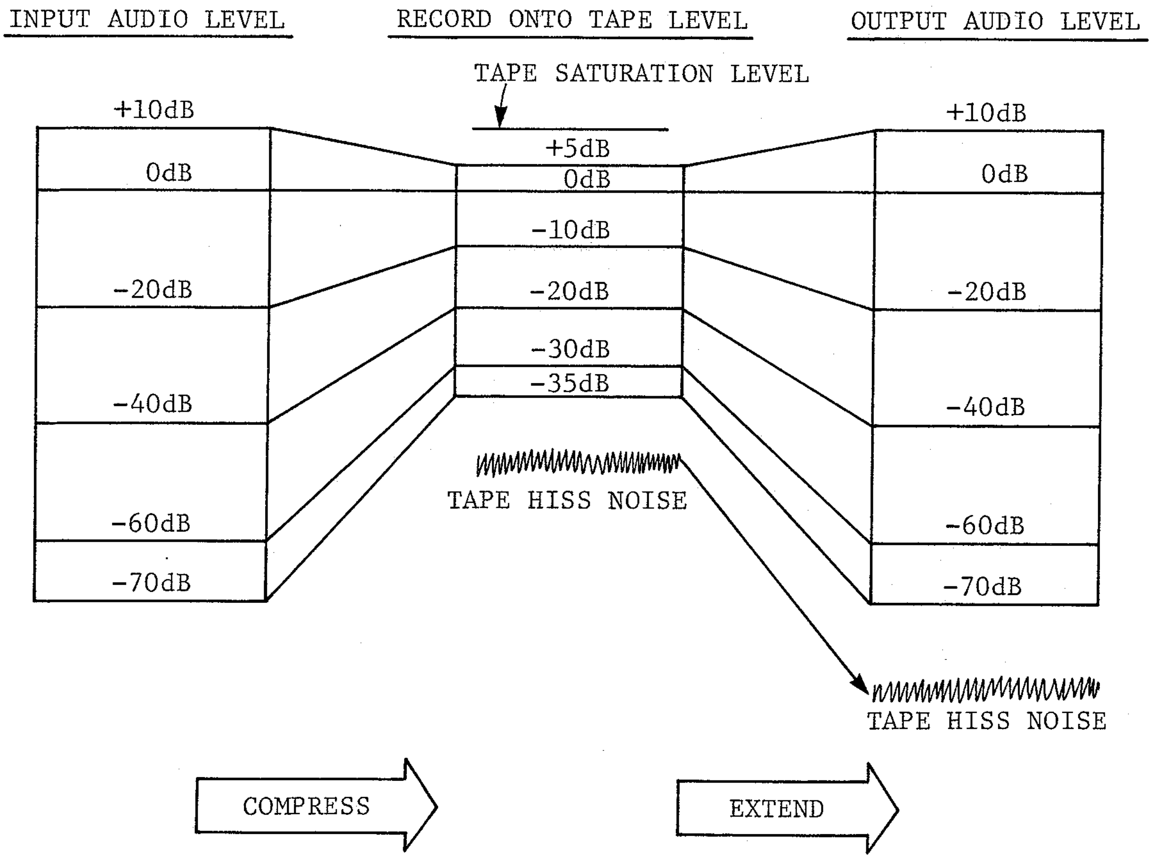

INPUT AUDIO LEVEL
RECORD ONTO TAPE LEVEL
OUTPUT AUDIO LEVEL
TAPE SATURATION LEVEL
+10dB
0dB
-20dB
-40dB
-60dB
-70dB
+5dB
0dB
-10dB
-20dB
-30dB
-35dB
TAPE HISS NOISE
+10dB
0dB
-20dB
-40dB
-60dB
-70dB
TAPE HISS NOISE
COMPRESS
EXTEND

Figure 6. Noise Reduction System

MECHANICAL DESCRIPTION

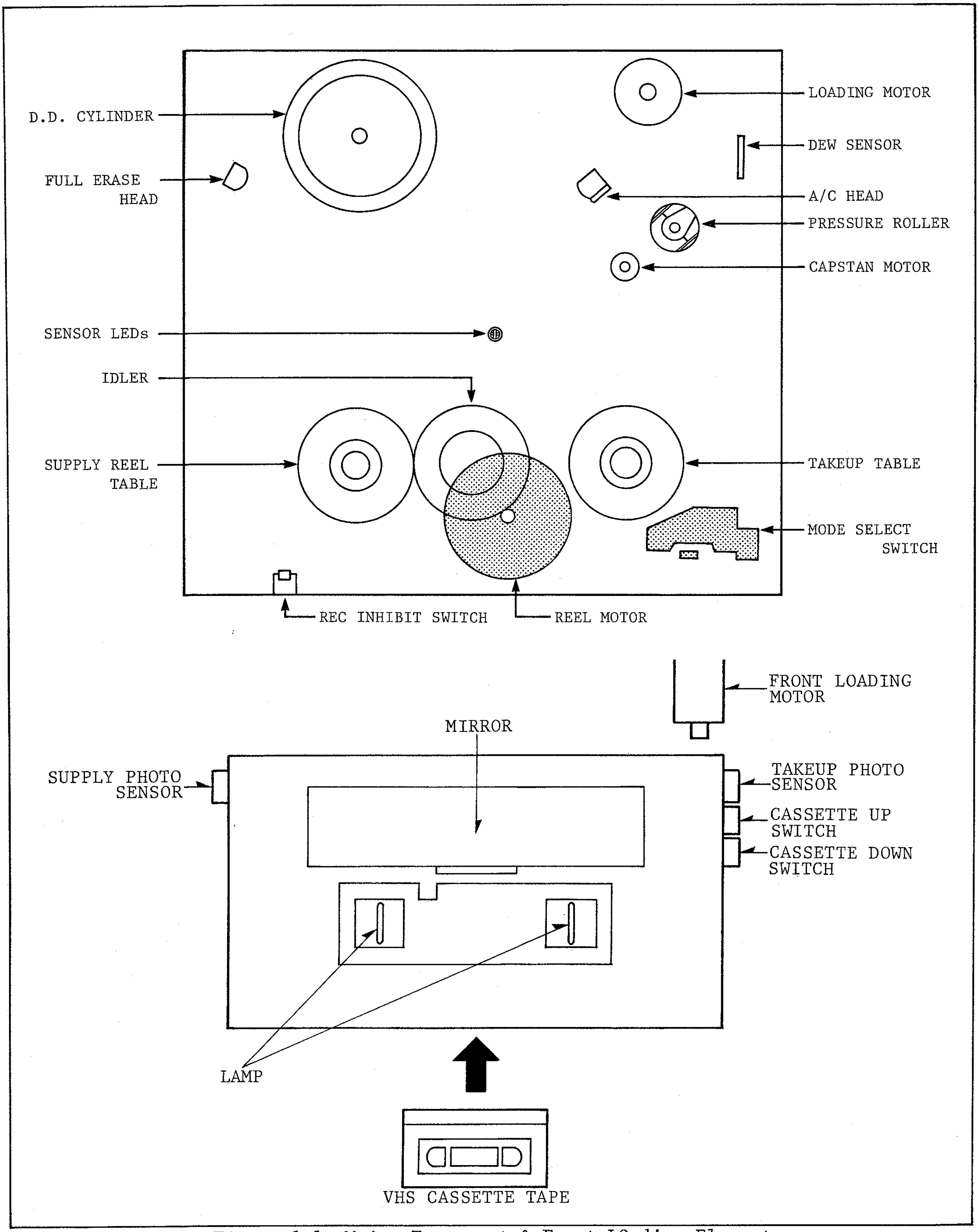

D.D. CYLINDER
FULL ERASE HEAD
LOADING MOTOR
DEW SENSOR
A/C HEAD
PRESSURE ROLLER
CAPSTAN MOTOR
SENSOR LEDs
IDLER
SUPPLY REEL TABLE
TAKEUP TABLE
MODE SELECT SWITCH
REC INHIBIT SWITCH
REEL MOTOR
FRONT LOADING MOTOR
MIRROR
SUPPLY PHOTO SENSOR
TAKEUP PHOTO SENSOR
CASSETTE UP SWITCH
CASSETTE DOWN SWITCH
LAMP
VHS CASSETTE TAPE

Figure 1-1. Major Transport & Front LOading Elements.

1. General Mechanical Description

The Panasonic VHS model AG-6800 Video Cassette Recorder is designed for "Hi-Fi sound dubbing with see through front loading full logic control.
In addition, the AG-6800 features several playback speeds (Forward X1/25, X1/10, X1/5, X1/2, X1, X2, X6, X10 and Reverse X1/2, X1, X2, X6, X10) when the remote controller Model AG-A600 is connected as well as a tape time display in all modes. (Mechanical Operation in Recording mode is identical to normal speed forward playback).

1-1. Overall Transport

The AG-6800 is constructed on a VHS chassis, employing 5 motors for the cassette and tape transport mechanism and no solenoids.
This allows a reduction in the number of mechanical parts compared with previous VHS models. These electro-mechanical devices are controlled by 5 microcomputers (described in the system control section). See Figure 1-1 for the location of the major parts of the transport mechanism. Note that this unit uses a single reel motor and idler.

1-2. Major Functions/Features

1-2-1. No Solenoid Mechanism

The Pressure Roller and Brake Functions which are usually controlled by solenoids are performed instead by the movements of the Cam Gear and Main Lever. Figures 1-2 and 1-3 give simplified illustrations of the function sequences. The Pressure Roller function is also discussed in a separate paragraph below, and the brake functions are described in the detail section.

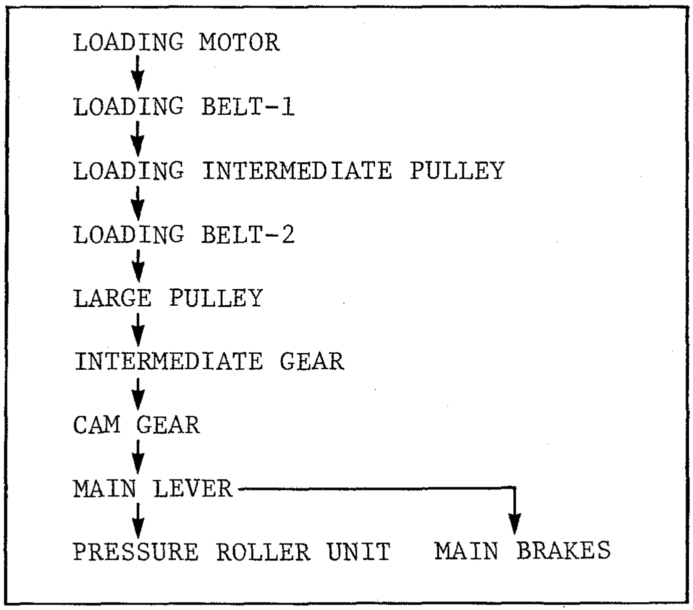

LOADING MOTOR
LOADING BELT-1
LOADING INTERMEDIATE PULLEY
LOADING BELT-2
LARGE PULLEY
INTERMEDIATE GEAR
CAM GEAR
MAIN LEVER
PRESSURE ROLLER UNIT
MAIN BRAKES

Figure 1-2. Pressure Roller and Main Brakes Loading Mode Simplified Sequence.

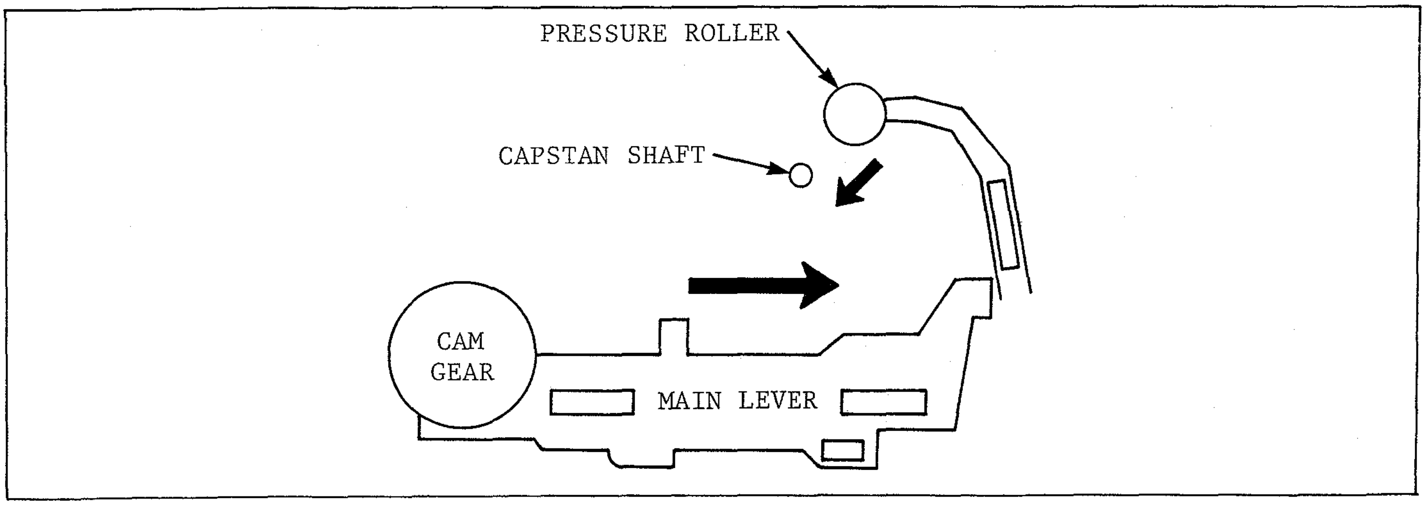

PRESSURE ROLLER
CAPSTAN SHAFT
CAM GEAR
MAIN LEVER

Figure 1-3. Simplified Illustration of Pressure Roller Movement in Loading Mode.

1-2-2. Direct Drive Cylinder Unit

The compact size Direct Drive Cylinder Unit has a 6 head system in order to accommodate all the special functions of the AG-6800.
There are two Video heads, two Audio heads, and two dummy heads mounted on the Direct Drive Cylinder Unit.
Two 58μ heads are used for the normal record and playback modes, the other two 42.4μ heads are used for the Audio Hi-Fi record and playback, and dummy heads are used for only smooth tape pass during shuttle search. These heads are not used for Still and Slow playback.
Audio Heads are advanced 120° from Video heads (See Figure 1-4).

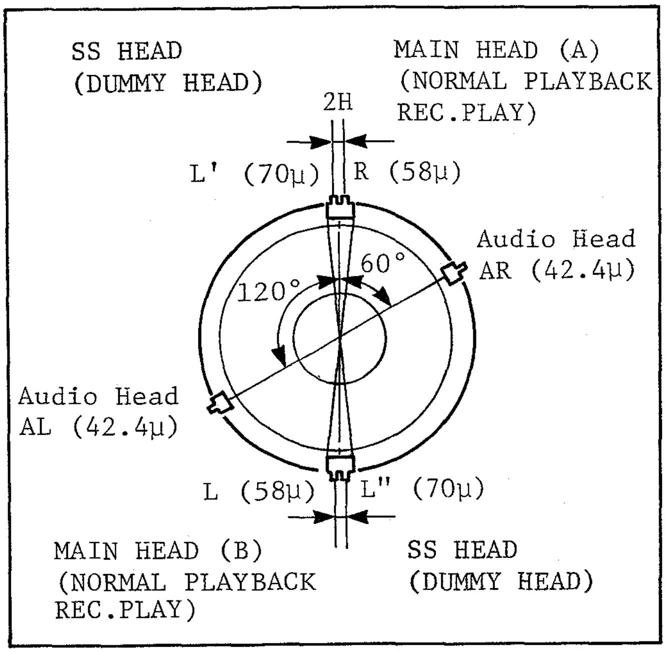

SS HEAD
(DUMMY HEAD)
MAIN HEAD (A)
(NORMAL PLAYBACK
REC.PLAY)
2H
L' (70μ)
R (58μ)
Audio Head
AR (42.4μ)
60°
120°
Audio Head
AL (42.4μ)
L (58μ)
L" (70μ)
MAIN HEAD (B)
(NORMAL PLAYBACK
REC.PLAY)
SS HEAD
(DUMMY HEAD)

Figure 1-4. Video Head's Configuration.

1-2-3. Direct Drive Capstan Motor

When the remote controller Model AG-A600 is connected, A new Direct Drive Capstan Motor allows Search Forward/Reverse in several speeds (Forward X1/25 ∿ X10, Reverse X1/2 ∿ X10) which includes Normal Play/Record modes, a Frame Advance mode, and also provides for a general improvement in picture quality. Part of the improvement is the use of an infrared LED and two phototransistors to generate the speed feed back or FG (Frequency Generator) signal. To achieve this, the capstan motor outer ring has 714 very fine slits. See Figure 1-6.

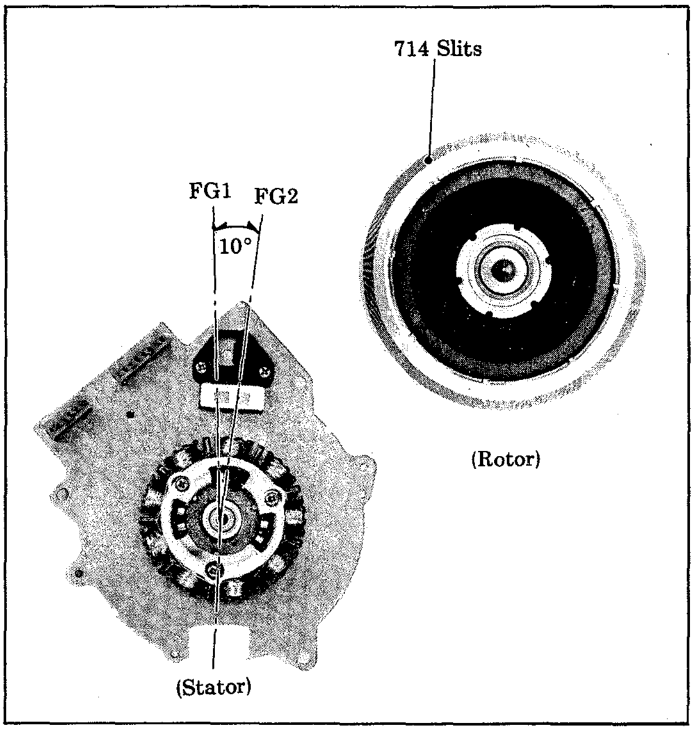

714 Slits
FG1
FG2
10°
(Rotor)
(Stator)

Figure 1-6.

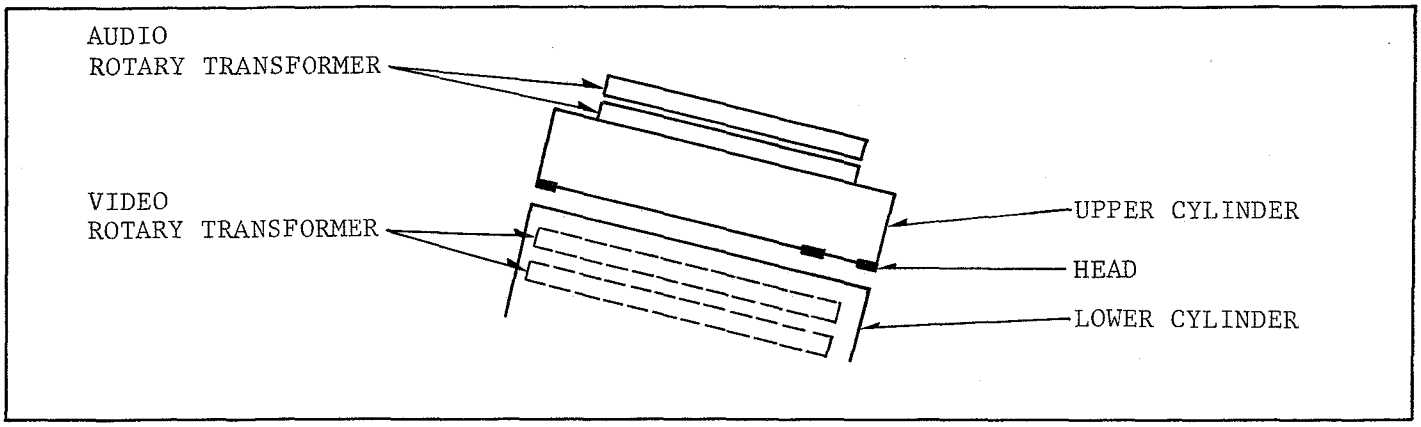

AUDIO
ROTARY TRANSFORMER
VIDEO
ROTARY TRANSFORMER
UPPER CYLINDER
HEAD
LOWER CYLINDER

Figure 1-5.

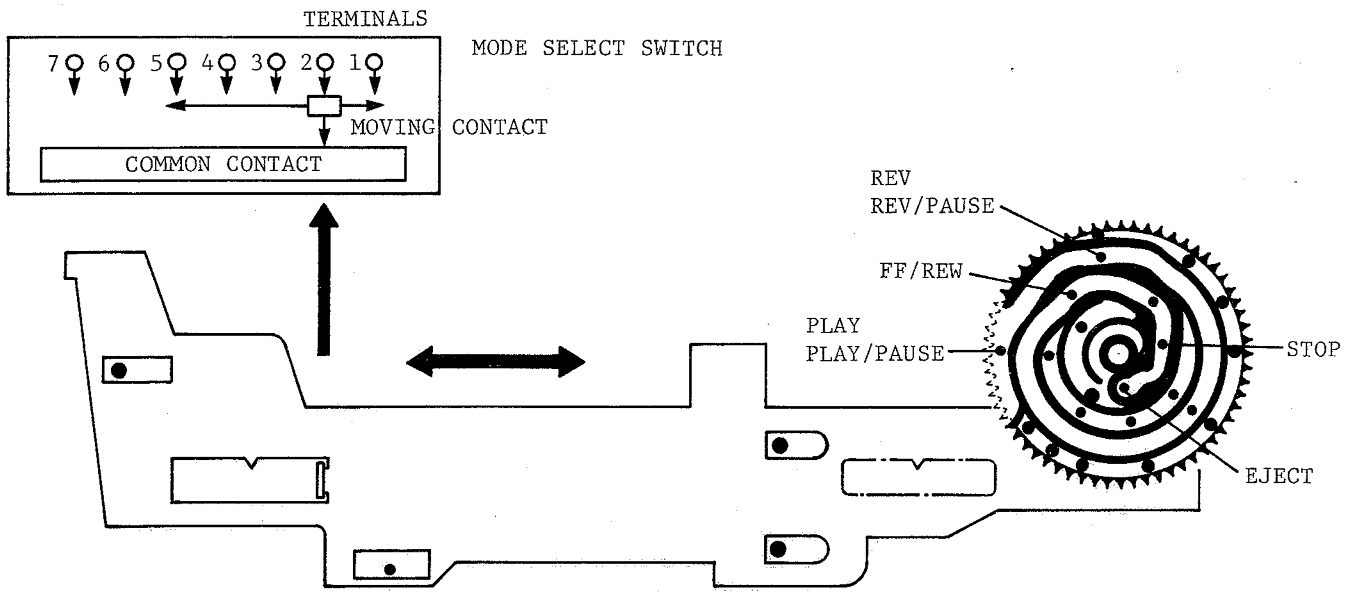
There are two infrared frequency generator positions (FG1 and FG2), and each FG consists of an LED and a phototransistor located above and below the slits in the rotor.
When infrared light from the LED is detected by the phototransistor through the slits in the rotor, pulses are produced with a phase relationship between FG1 and FG2 of 90°. These two signals are used to detect the direction of the capstan motor rotation.

1-2-4. Front Loading System Mirror

Since the cassette tape cannot be viewed directly in the Front Loading System of the AG-6800, a lighted mirror system is used. (See lower half of Figure 1-1 and Figure 1-8.) When the cassette is in the Loaded position, two lamps light up the mirror image of the tape and make it visible through the cassette window.

1-2-5. Cam Gear and Mode Select Switch

The rotation and direction of the Loading motor is conveyed to the Cam Gear, and then to the Mode Select Switch via the Main Rod. A moving contact on the Mode Select Switch senses the various mode portions along the switch as shown in Figure 1-7. The Cam Gear drives all further movements of mechanical parts such as levers, gears, and rollers (see Detailed Description section for operation of the Cam Gear and Mode Select Switch).
The status of the transport mechanism is then fed back to the electronic System Control circuit through the Mode Select Switch. This combination of the mechanism and electrical switches stops the mechanical movement at the proper position for each mode.



MODE SELECT SWITCH
POSITION FUNCTIONS

POSITION 1: EJECT
POSITION 2: OPEN
POSITION 3: STOP
POSITION 4: FF REW
POSITION 5: OPEN
POSITION 6: REV
REV/PAUSE
POSITION 7: PLAY
PLAY/PAUSE

Figure 1-7. Cam Gear and Mode Select Switch.

1-2-6. LED Sensor Lamp

The AG-6800 video tape recorder employs a longer lasting Light Emitting Diode in place of the incandescent sensor lamp to handle the increased use of this sensor with editing video tape recorders.
The light from the diode is used in conjunction with the takeup and supply phototransistors to detect the beginning and end of the tape.

1-2-7. Pressure Roller Function

In the Loading mode, the cam gear moves the Pressure Roller very close to the capstan shaft.
This prevents errors in tape control pulse (CTL) counts during the Loading to Play mode, transmission. In both Pause and Still mode, when the remote controller Model AG-A600 is connected; the Pressure Roller remains engaged to the Capstan shaft, and prevents the tape from moving.

1-2-8. Subloading Function

The Subloading Function brings the tape in contact with the Audio heads and the CTL head which detects the control pulse.

2. Detailed Mechanical Description

2-1. Front Loading Mechanism

2-1-1. Cassette Detection & Elevator Down

When the tape is placed into the cassette compartment, Cassette Up SW opens. (When no cassette is inserted, Cassette Up SW closes.)
When the Cassette Up SW opens a Front Loading Motor turns counterclockence. wise and starts the Front Loading sequ- Figures 1-10 and 1-12 summarize the Loading sequence in flowchart form, and Figures 1-9 and 1-11 identify the components referred to in the sequence. A more detailed description of the complete Loading operation is given in a later paragraph.

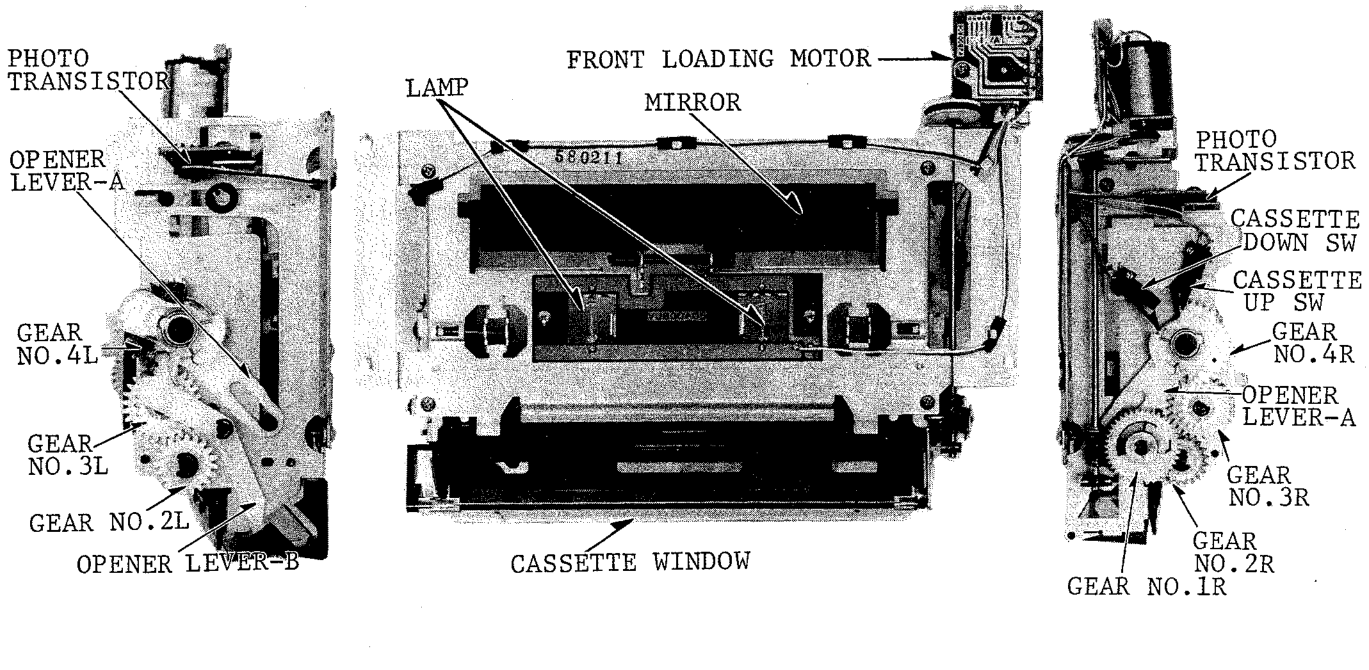


PHOTO TRANSISTOR
OPENER LEVER-A
GEAR NO.4L
GEAR NO.3L
GEAR NO.2L
OPENER LEVER-B
LAMP
FRONT LOADING MOTOR
MIRROR
580211
CASSETTE WINDOW
PHOTO TRANSISTOR
CASSETTE DOWN SW
CASSETTE UP SW
GEAR NO.4R
OPENER LEVER-A
GEAR NO.3R
GEAR NO.2R
GEAR NO.1R

Figure 1-8. Cassette Compartment Parts.

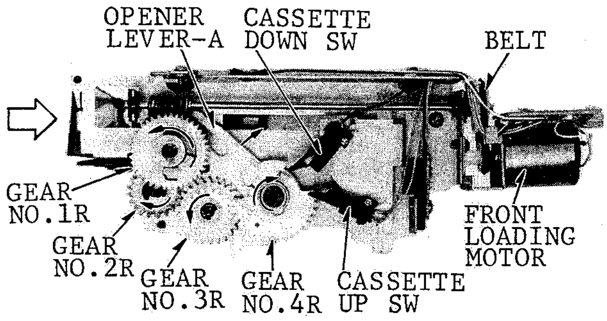

OPENER LEVER-A
CASSETTE DOWN SW
BELT
GEAR NO.1R
GEAR NO.2R
GEAR NO.3R
GEAR NO.4R
CASSETTE UP SW
FRONT LOADING MOTOR

Figure 1-9. Right Side Front Gears Movement. (Loading)

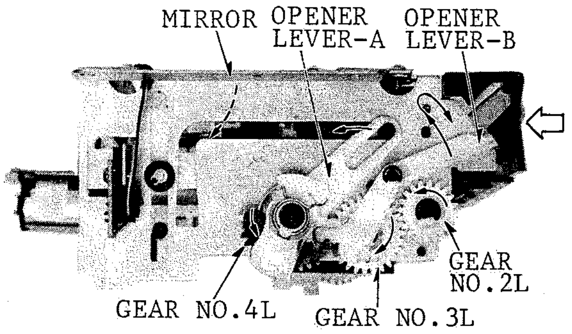

MIRROR
OPENER LEVER-A
OPENER LEVER-B
GEAR NO.2L
GEAR NO.4L
GEAR NO.3L

Figure 1-11. Left Side Front Gears Movement. (Loading)

RIGHT SIDE

FRONT GEARS SEQUENCE

CASSETTE UP SWITCH OPENS
↓
FRONT LOADING MOTOR TURNS COUNTERCLOCKWISE
↓
GEAR NO.1R TURNS COUNTERCLOCKWISE
↓
GEAR NO.2R TURNS CLOCKWISE
↓
GEAR NO.3R TURNS COUNTERCLOCKWISE
↓
GEAR NO.4R TURNS CLOCKWISE
↓
OPENER LEVER A TURNS CLOCKWISE
↓
MIRROR AND CASSETTE HOLDER DOWN
↓
CASSETTE DOWN SWITCH ON BY GEAR NO.4R
↓
TWO LAMP's TURNED ON BY CASSETTE DOWN SWITCH ON
↓
CASSETTE TAPE LOWERED

Figure 1-10. Front Loading Sequence. (Right Side)

LEFT SIDE

FRONT GEARS SEQUENCE

GEAR NO.2L TURNS COUNTERCLOCKWISE
↓
GEAR NO.3L TURNS CLOCKWISE
↓
GEAR NO.4L TURNS COUNTERCLOCKWISE
↓

OPENER LEVER A TURNS COUNTERCLOCKWISE	OPENER LEVER B TURNS COUNTERCLOCKWISE
↓	↓
MIRROR AND CASSETTE HOLDER DOWN	OPENER LEVER B TURNS CLOCKWISE
↓	↓
CASSETTE TAPE LOWERED	CASSETTE WINDOW IS CLOSED

Figure 1-12. Front Loading Sequence. (Left Side)

2-1-2. Eject Mechanism

When the Eject Button is pressed, the Front Loading motor turns clockwise and starts the Eject sequence. Figures 1-14 and 1-16 summarize the Eject sequence in flowchart form, and Figures 1-13 and 1-15 identify the component referred to in the sequence. A detailed description of the complete Eject operation is given in a later paragraph.

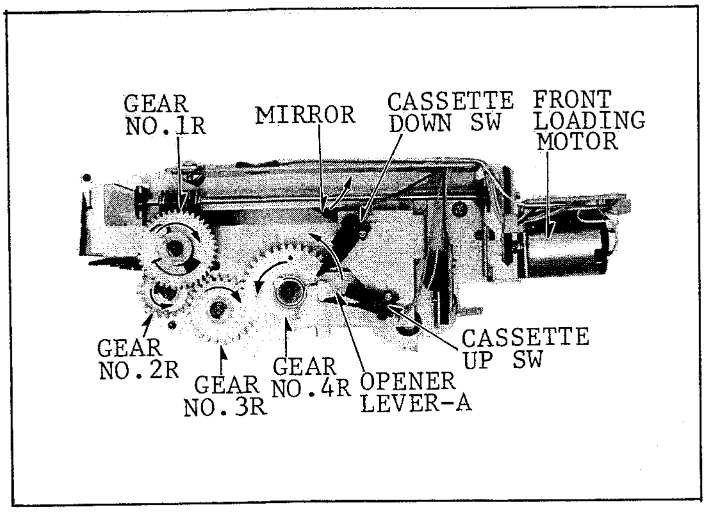

GEAR NO.1R
MIRROR
CASSETTE DOWN SW
FRONT LOADING MOTOR
GEAR NO.2R
GEAR NO.3R
GEAR NO.4R
OPENER LEVER-A
CASSETTE UP SW

Figure 1-13. Right Side Front Gears Movement. (EJECT)

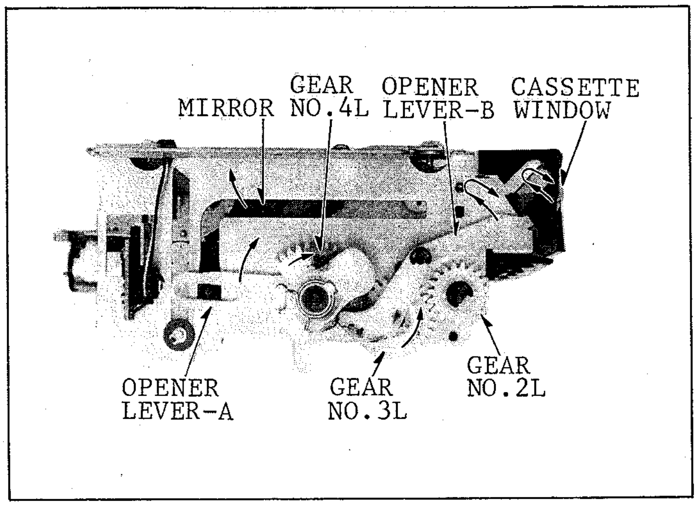

MIRROR
GEAR NO.4L
OPENER LEVER-B
CASSETTE WINDOW
OPENER LEVER-A
GEAR NO.3L
GEAR NO.2L

Figure 1-15. Left Side Front Gears Movement. (EJECT)

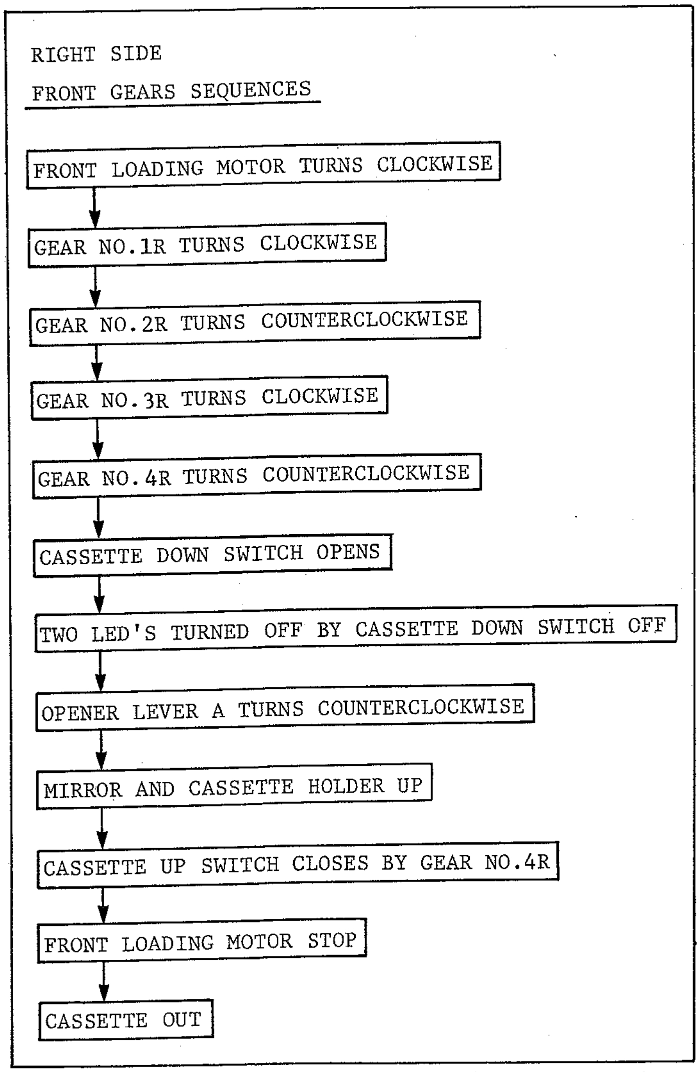

RIGHT SIDE
FRONT GEARS SEQUENCES
FRONT LOADING MOTOR TURNS CLOCKWISE
GEAR NO.1R TURNS CLOCKWISE
GEAR NO.2R TURNS COUNTERCLOCKWISE
GEAR NO.3R TURNS CLOCKWISE
GEAR NO.4R TURNS COUNTERCLOCKWISE
CASSETTE DOWN SWITCH OPENS
TWO LED'S TURNED OFF BY CASSETTE DOWN SWITCH OFF
OPENER LEVER A TURNS COUNTERCLOCKWISE
MIRROR AND CASSETTE HOLDER UP
CASSETTE UP SWITCH CLOSES BY GEAR NO.4R
FRONT LOADING MOTOR STOP
CASSETTE OUT

Figure 1-14. Eject Sequence (Right Side).

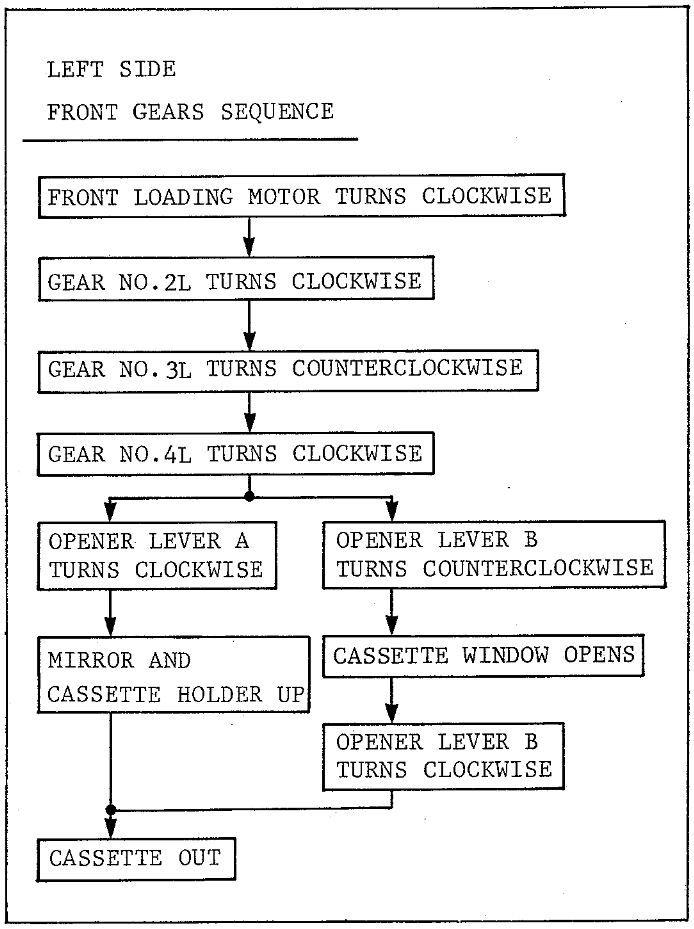

LEFT SIDE
FRONT GEARS SEQUENCE
FRONT LOADING MOTOR TURNS CLOCKWISE
GEAR NO.2L TURNS CLOCKWISE
GEAR NO.3L TURNS COUNTERCLOCKWISE
GEAR NO.4L TURNS CLOCKWISE
OPENER LEVER A TURNS CLOCKWISE
OPENER LEVER B TURNS COUNTERCLOCKWISE
MIRROR AND CASSETTE HOLDER UP
CASSETTE WINDOW OPENS
OPENER LEVER B TURNS CLOCKWISE
CASSETTE OUT

Figure 1-16. Eject Sequence (Left Side)

Power Section (Middle Panel)

① Power Switch [POWER]

Power is supplied to the unit when this switch is activated. The audio CH 1, CH 2 meter and eject lamps light. The tape counter illuminates, and the tape is set to intermediate loading position. When the switch is pushed again, the power is switched off.

② Auto OFF Lamp [AUTO OFF]

This lamp lights when condensation has formed inside the unit, which cause the unit to cease operating. The cassette tape will be ejected automatically. It flashes when something is wrong with the tape transport (such as tape slack). The unit does not operate when this lamp is either lit or flashing. (Power Switch ① will not apply power).

Audio Section (Middle/Lower Panels)

③ Meter Selector [METER]

This is the audio level meter selection switch.

HD: Use when adjusting the HD sound recording input level.

NORM: Use when adjusting the normal audio recording input level.

④ Audio Channel 1 Level Meter

This is the audio channel 1 peak level meter.
Adjust channel 1 level control ⑤ so that the meter needle does not cross 0dB.

⑤ Audio Channel 1 Level Control

The inside knob is the level control knob for normal audio, and the outside is for HD sound. When using normal input the control is normally set at the click stop. To adjust the normal audio level, set the Audio Limiter ⑧ to "OFF" and then adjust this control so that Level Meter ④ does not cross 0dB.

⑥ Audio Channel 2 Level Meter

The operation of this is the same as described for channel 1 in ④.

⑦ Audio Channel 2 Level Control

The operation of this is the same as that for channel 1 described in ⑤.

⑧ Audio Limiter Selector [AUDIO LIMITER]

This selector only works during normal audio recording.

ON: When loud instantaneous noises are entering the audio input, set the audio limiter selector switch to this position. The audio limiter circuit will then operate to maintain distortion-free recording.

OFF: The sound is recorded just as it enters. Since the limiter does not operate to limit unusually loud noises, it is necessary to set the audio level low.

⑨ Dolby NR Switch [DOLBY NR]

This only works during normal audio recording. When the Dolby NR Switch is set to the "IN" position, Dolby NR System is activated.

⑩ Dolby NR Lamp

When the Dolby NR Switch is in the "IN" position, this lamp is illuminated and the Dolby Noise-Reduction System is enabled.

⑪ Time Code Lamp [TIME CODE]

When the Audio CH 2 Selector Switch ㊷ on the rear panel is set to TIME CODE, this lamp lights.

Operating Buttons Section (Upper/Middle Panels)

⑫ Cassette Holder

⑬ Eject Button/Lamp [EJECT]

To remove a cassette, press this button.
If this button is pressed while the tape is moving, (during playback, fast forward or rewind) the unit will stop and then eject the cassette tape.

⑭ Rewind Button/Lamp [REW]

When this button is pressed, the cassette tape is rewound to the supply reel.

⑮ Play Button/Lamp [PLAY]

Pressing this button causes the tape to start playback. If Record Button is held down first, and then this button is pressed, the unit will go into the recording mode.

⑯ Fast Forward Button/Lamp [FF]

When this button is pressed, the tape is wound rapidly onto the takeup reel.

⑰ Record Button/Lamp [REC]

This button should be pressed and held in while Play Button is pressed to start recording both video and audio.

⑱ Stop Button/Lamp [STOP]

Used to stop the tape movement.

Tape Counter Section (Upper Panel)

⑲ Tape Counter

📼 : indicates that the cassette is in the cassette holder.

▬ : indicates the minus counter position "-*:**:**" when the tape is rewound beyond the reset (0:00:00) position.

-000: indicates the counter (0:00:00) search mode by pressing the Rewind or Fast Forward Button.

⮌ : indicates the one-time repeated playback mode.

🔁 : indicates the random repeated playback mode.

BEG: indicates the program start position which is to be repeated.

END: indicates the program end position which is to be repeated.

LAP: indicates the tape position from the reset point.

REMAIN: indicates remaining tape time.

RESET Button: For setting the tape counter to "0:00:00".

TAPE MEMORY Button: For selection in either automatic tape stop when the counter reaches "0:00:00" in the rewind, fast forward, or the repeated playback modes.

BEG Button: For selection of the program start position which is to be repeated.

END Button: For selection of the program end position which is to be repeated.

LAP/REMAIN Button: For selection of either the elapsed time (normal tape position from reset point) or the remaining tape time indication on the counter.

Lamp Section (Middle/Lower Panels)

⑳ HD Lamp

This lights up when HD sound is being monitored or recorded.

- When performing recording with the Audio Recording Selector ㉒ set to "HD/NORM" the HD lamp will light (when the Audio Recording Selector is set to "NORM", HD sound will not be recorded, and thus the HD lamp will remain out).
- HD lamp will light during playback only for tapes which have been recorded with HD sound (Audio Monitor Selector ㉑ must be set to HD/Auto).

㉑ Audio Monitor Selector [AUDIO MONITOR]

The audio signal which appears at the Audio Monitor Output Jacks ㊵ the Headphone Jack ㉕ and the TV Monitor Connector ㊺.

HD/AUTO: HD sound or automatically switched Normal sound appears at monitor connectors.

NORMAL: Only Normal sound appears at monitor connectors.

- The Monitor Channel Selector controls Normal Audio monitoring at the Headphones jack and Monitor TV connector or follows:

  CH 1: Only channel 1 audio at Monitor TV and Headphones jack.

  MIX: Mixed channel 1 and channel 2 at Monitor TV connector.
  Separate channel 1 and channel 2 at Headphones jack.

  CH 2: Only channel 2 audio at Monitor TV and Headphones jack.

㉒ Audio Recording Selector [AUDIO REC]

HD/NORM: to record HD and NORMAL sound.

NORM: to record only normal audio.

㉓ Mode Lock Lamp

When the Mode Lock Selector switch on the rear panel is set to "ON", the ML (Mode Lock) lamp lights up.

㉔ Recording Remote Control Error Lamp

When the recording remoter control Jack is used to perform dubbing, if (1) recording cannot proceed within about 10 seconds after an attempt is made to start recording, or (2) the end of the tape is reached, this lamp flashes on and off.

Headphone Section (Lower Panel)

㉕ Headphones Jack [HEADPHONES]

Permits listening with headphones to a channel or channels selected by the Audio Monitor Selector.

㉖ Headphones Level Control [HEADPHONES-LEVEL]

This volume controls the headphones level.

Tracking Section (Lower Panel)

㉗ Tracking Control [TRACKING]

Normally leave this control in its center "FIX" detent position. Occasionally tapes made on other video cassette recorders may exhibit noise or streaks during the normal playback and may require adjustment of this control.

Tape Selector (Lower Panel)

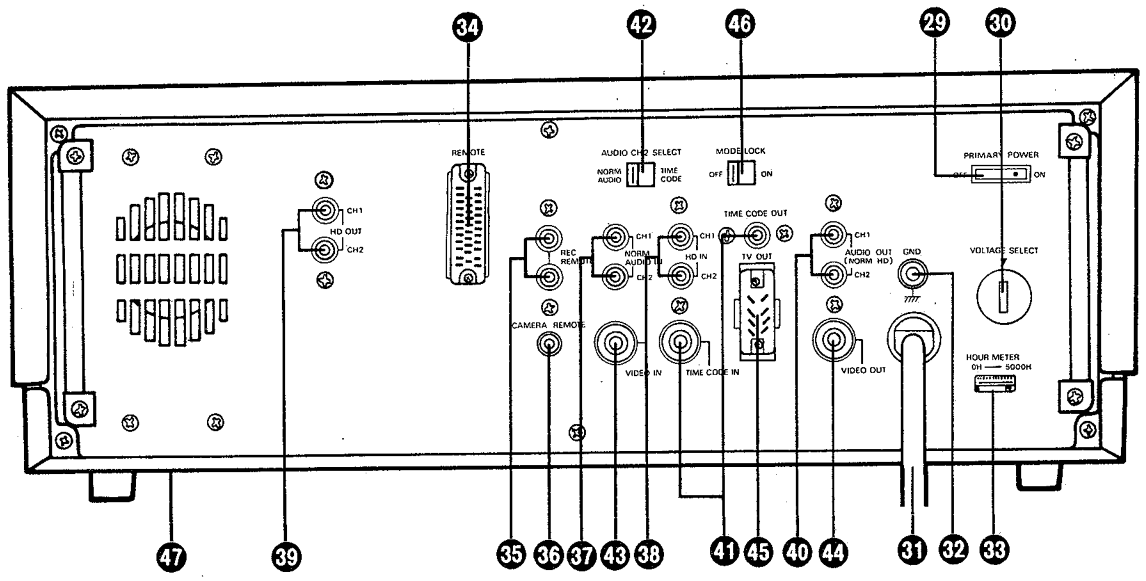
㉘ Tape Remaining Selector [TAPE REMAIN]

Matches time countdown circuits to the type of tape used.

T160: For use with the NV-T160 tape.

NOR: For use with the NV-T120, T60 or T30 tape.

Connectors


㉞
㊷
㊻
㉙
㉚
REMOTE
AUDIO CH2 SELECT
NORM AUDIO
TIME CODE
MODE LOCK
OFF
ON
PRIMARY POWER
OFF
ON
CH1
HD OUT
CH2
REC REMOTE
CH1
NORM AUDIO IN
CH2
CH1
HD IN
CH2
TIME CODE OUT
TV OUT
CH1
AUDIO OUT (NORM HD)
CH2
GND
VOLTAGE SELECT
CAMERA REMOTE
VIDEO IN
TIME CODE IN
VIDEO OUT
HOUR METER
0H —— 5000H
㊼
㊴
㉟
㊱
㊲
㊸
㊳
㊶
㊺
㊵
㊹
㉛
㉜
㉝

Power Supply Section

㉙ Primary Power Off/On Switch [PRIMARY POWER]
Setting this switch to the off position removes all applied power from the unit.
Set the switch to the "OFF" position when this unit is not used for a long time.
Note that the front panel Power Switch is used to turn the unit ON and OFF during normal use.

㉚ Voltage Selector [VOLTAGE SELECT]
This selector can be set for 110, 120, 220, 240 Volt operation.
If it is necessary to change the voltage (preset to 120 V at the factory), consult page 1.

㉛ AC Power Cord
For connection to an AC electric outlet. This plug is a 3-prong grounded type. Do not defeat its purpose.

㉜ Ground Terminal [GND]
Connect to external ground, if audio hum or buzz is heard while monitoring or playing back.

㉝ Hour Meter
Shows operating time of the unit on a scale of 0 to 10 (0 to 5,000 HRs).

Remote Control Section

㉞ Remote Control Connector [REMOTE]
The optional accessory AG-A600 remote controller is connected here for remote control operation.

㉟ Recording Remote Control Jack [REC REMOTE]
This is used when the video and audio signals from a master VTR are to be dubbed onto other VTRs; dubbing can be done onto up to 500 VTRs at one time.

㊱ Camera Remote Control Jack [CAMERA REMOTE]
This is used when the unit is connected to a video camera that has a temporary stop capability.

Audio Jack Section

㊲ Normal Audio Input Jacks [NORM AUDIO IN]
These are audio input jacks for the two channels (channel 1 and channel 2). Recording is done by fixed heads. When the input is connected to these jacks, then HD recording is also done automatically when Audio Record switch ㉒ is set to HD/NORM.

㊳ HD Sound Input Jacks [HD IN]
These are audio input jacks for the two channels (channel 1 and channel 2), exclusively for HD use.

㊴ HD Sound Output Jacks [HD OUT]
These output jacks are exclusively for HD use.

㊵ Audio Monitor Output Jacks [AUDIO OUT]
These are normal audio and HD sound output jacks. The audio signals (Normal or HD) selected by the Audio Monitor Selector ㉑ on the front panel output here.

㊶ Time Code Input/Output Terminal
These terminals are used for recording and playback of the time code signal.

IN: The time code generator output is connected here using a connector of the BNC type.

OUT: The output from this Jack is connected to the input jack of the time code reader using a connector of the RCA type.

㊷ Audio Channel 2 Selector [AUDIO CH2 SELECT]
To record or play back the time code signal, set this selector to "TIME CODE".

Video Connector Section

㊸ Video Input Connector [VIDEO IN]
This video input connector is a connector of the BNC type.

㊹ Video Output Connector [VIDEO OUT]
This video output connector is a connector of the BNC type.

TV Monitor Section

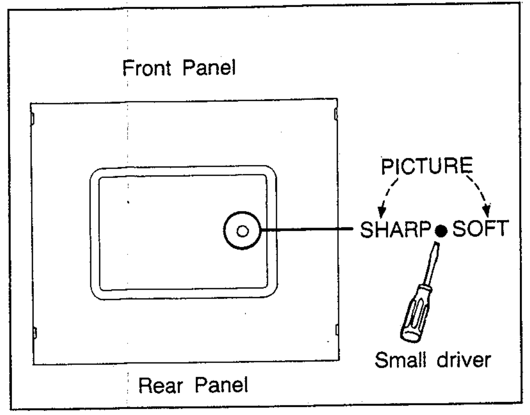
㊺ TV Monitor Connector [TV OUT]
Connect this unit to a TV Monitor using a connecting cable with 8-pin connectors. The only signals that appear at this connector are the video and audio output signals.

Mode Lock Section

㊻ Mode Lock Selector [MODE LOCK]
When this is set to "ON", the ML lamp on the front panel lights up and the control buttons will not work (except when operation is done by remote control).

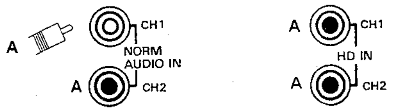
㊼ Picture Sharpness Control [PICTURE]
Control the playback picture so that its outlines are made sharper or softer. It has no effect on recording.

(Bottom View)

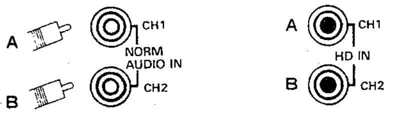

Front Panel
PICTURE
SHARP
SOFT
Small driver
Rear Panel

Connections

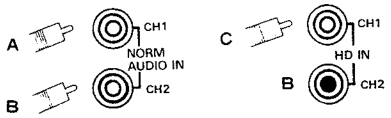
Depending on how the connections are made to the normal audio input terminals and the HD sound input terminals, the audio operation will change as shown below, so please keep this is mind in making these connections.


A
CH1
NORM AUDIO IN
A
CH2
A
CH1
HD IN
A
CH2

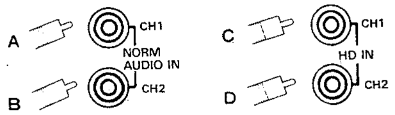
- Audio input A automatically inputs to the jacks with the solid circles in the middle.


A
CH1
NORM AUDIO IN
B
CH2
A
CH1
HD IN
B
CH2

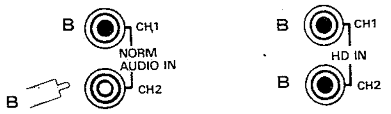
- A and B automatically input to the jacks with solid circles in the middle, as shown in the diagram.


A
CH1
NORM AUDIO IN
B
CH2
C
CH1
HD IN
B
CH2

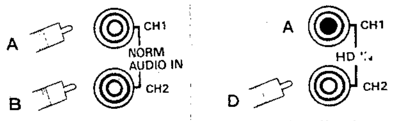
- Audio input B automatically inputs the jack with a solid circle in the middle.


A
CH1
NORM AUDIO IN
B
CH2
C
CH1
HD IN
D
CH2

- Audio inputs A, B, C and D are direct input to the jacks as shown in the diagram.

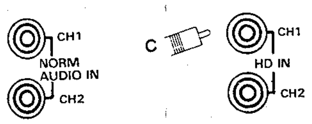

B
CH1
NORM AUDIO IN
B
CH2
B
CH1
HD IN
B
CH2

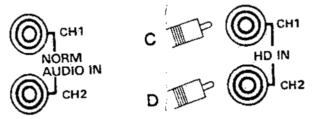
- Audio input B automatically inputs to the jacks with solid circles in the middle.

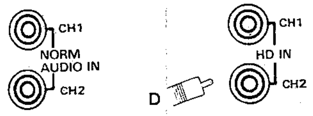

A
CH1
NORM AUDIO IN
B
CH2
A
CH1
HD IN
D
CH2

- Audio input A is automatically input to the jack with a solid circle in the middle.

Caution
As shown in the diagrams below, audio input connected to the HD input jacks inputs only to those jacks to which it is directly connected. There is no input to the normal audio input jacks!

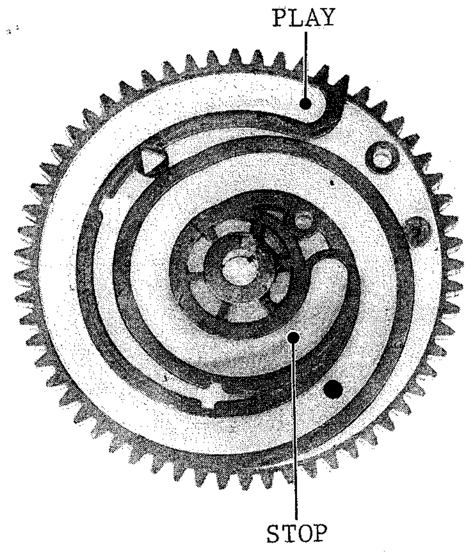

CH1
NORM AUDIO IN
CH2
C
CH1
HD IN
CH2


CH1
NORM AUDIO IN
CH2
C
CH1
HD IN
D
CH2

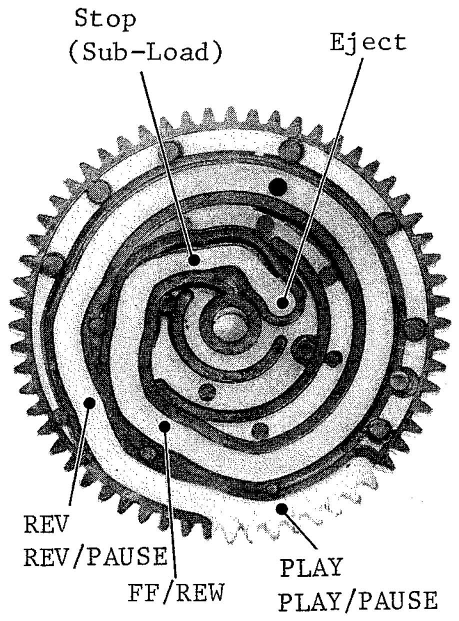

CH1
NORM AUDIO IN
CH2
CH1
HD IN
D
CH2

2-2. Cam Gear and Mechanical Timing

The Cam Gear establishes the position and timing for the transport mechanism. The Cam Gear has outer teeth, and a different slot-type cam on each face or side. (See Figure 1-17) The two sides are the Head (the side seen from the bottom of the unit), and the tail (the side hidden from view). The slot-type cam on the head side drives the Sector Gear (9), while the slot-type cam on the tail moves the main lever (8).



HEAD OF GEAR (SECTOR GEAR SIDE)



TAIL OF GEAR (MAIN LEVER SIDE)

Figure 1-17. Cam Gear Slots.

Figure 1-18 shows the mechanical timing sequences of the Cam Gear and the parts driven by this gear.
The upper chart gives the movement of the Main Lever and Sector Gear as a function of the cam rotation angle, and shows the Corresponding Mode Select Switch positions.

The lower chart indicates the ON/OFF and IN/OUT time periods of other mechanism main parts for the corresponding Cam Gear rotation angle.

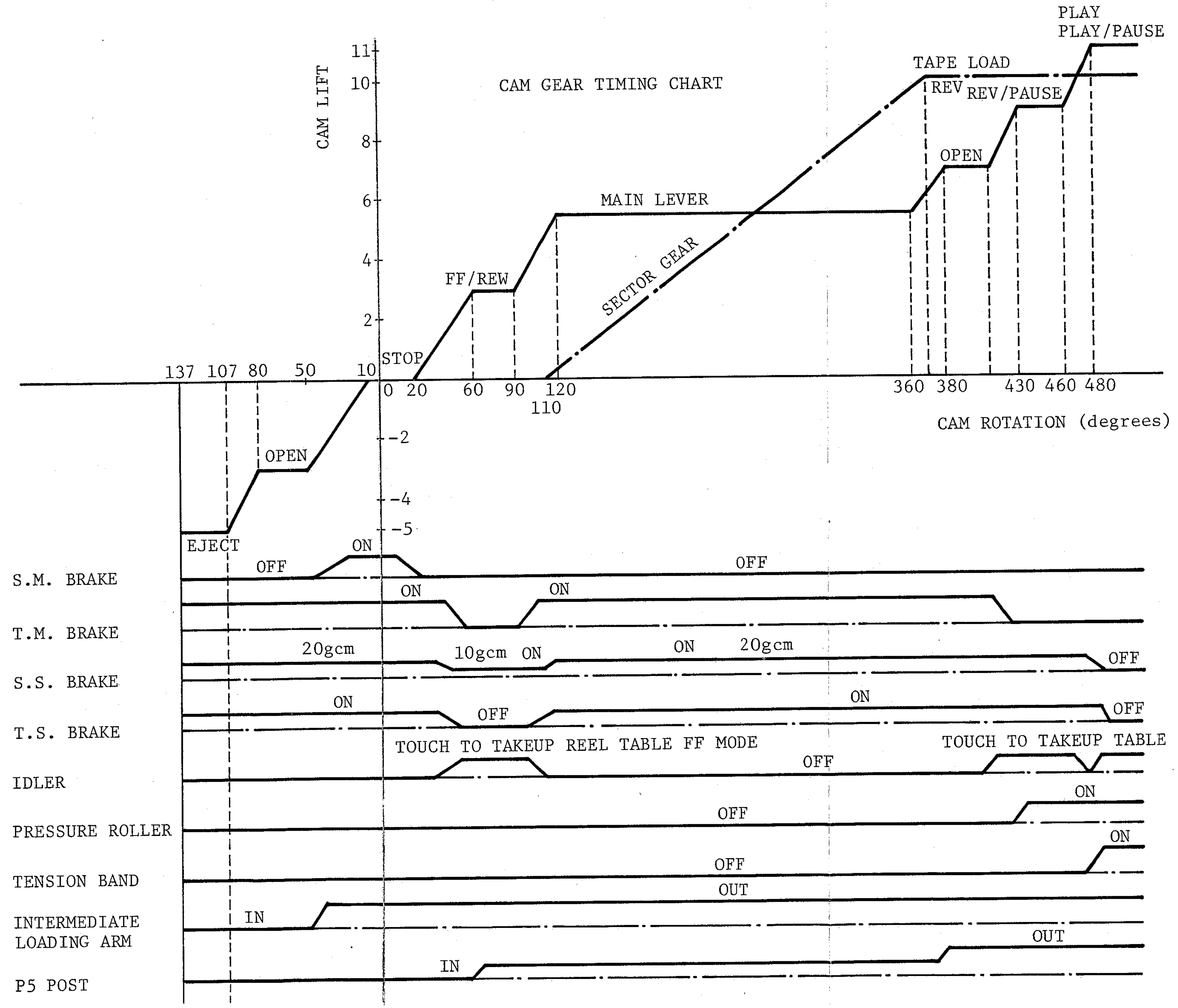


Figure 1-18. Mechanical Timing Chart. (When the remote controller AG-A600 is connected)

2-3. Operating Mode Sequences

2-3-1. Subloading

The AG-6800 unit require that the tape be brought in contact with the AUDIO/CTL HEAD (A/C Head) during Fast Forward and Rewind for CTL counting.
Therefore, when a tape is inserted into the unit, the System Control causes the Loading Motor to run until the tape is extracted from the cassette for this purpose (See Figure 1-19).
This position is also used for the Stop mode, as well as for the FF/REW modes. (If the Eject button is pressed, the unit must unload prior to ejecting the tape cassette.)

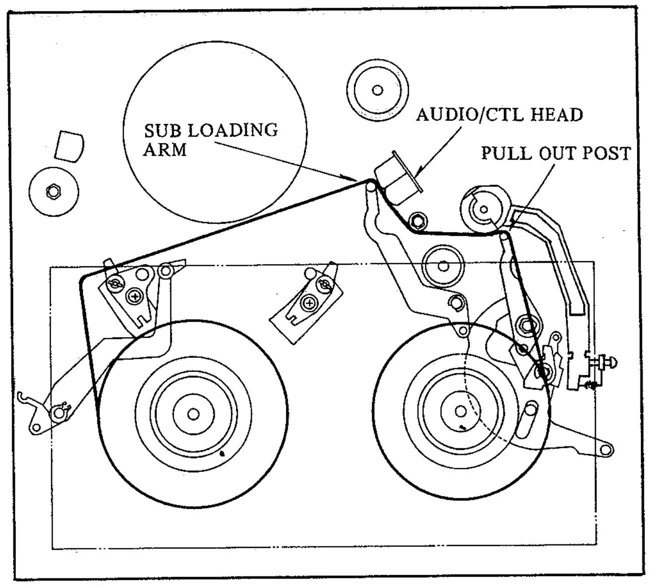

SUB LOADING ARM
AUDIO/CTL HEAD
PULL OUT POST

Figure 1-19. Subloading Tape path.

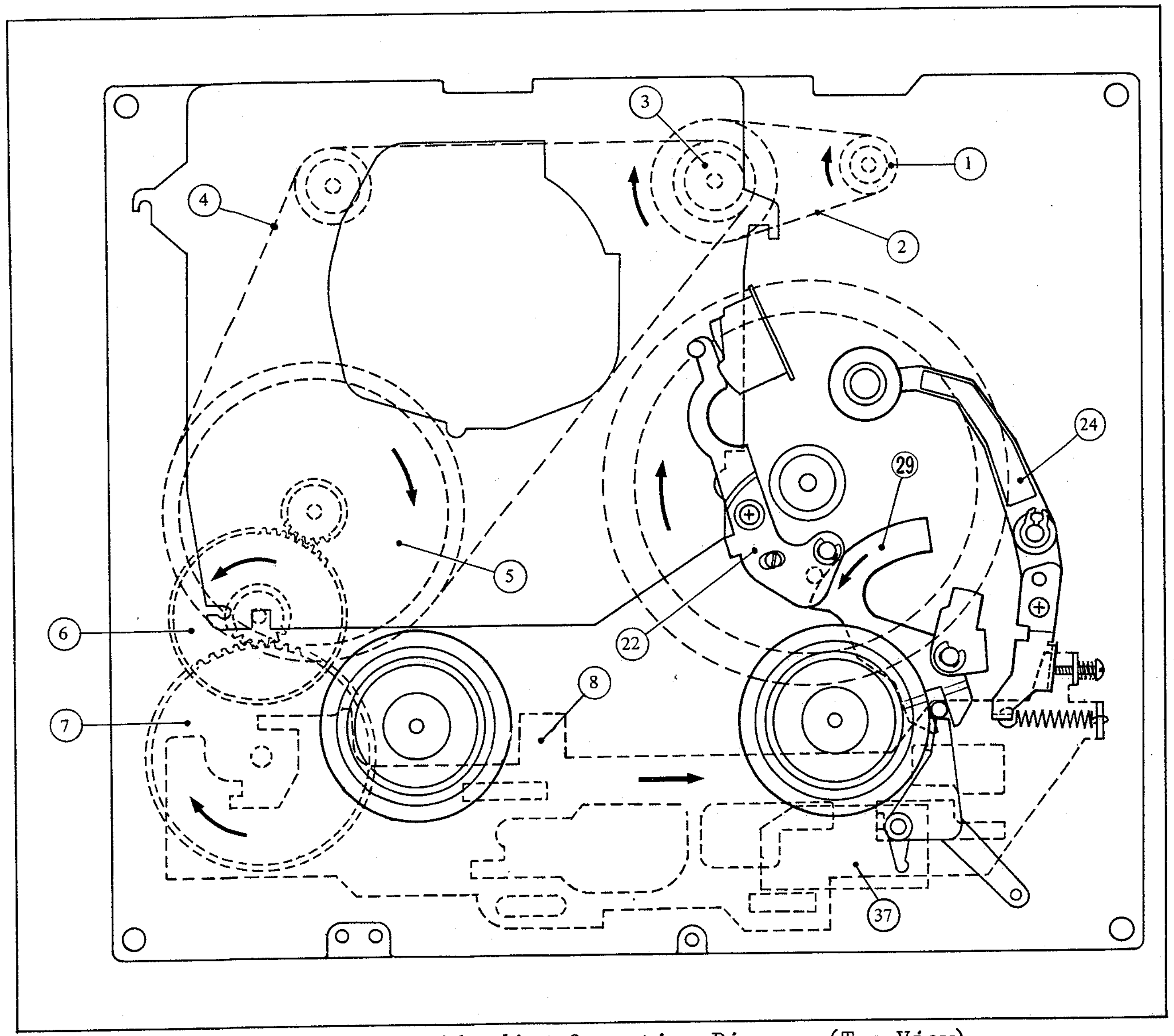

3
1
4
2
24
29
5
6
22
8
7
37

Figure 1-20. Subloading Operation Diagram (Top View).

As described above, the Loading Motor drives the Cam Gear, and the Cam Gear then moves the Main Lever (The Sector Gear does not move yet because of the cam timing relationship).
Refer to the Subloading Operation diagram (Figure 1-20), and the Subloading Operation Flowchart (Figure 1-21) for the Subloading sequence. The main tape loading movements are:

(a) As the Main Lever (8) moves to the right, the Action Lever (29) rotates counterclockwise.

(b) Subloading Arm (22) rotates clockwise, which pulls the tape out of the cassette and into the position shown in Figure 1-19.

2-3-2. Loading Operation

This section describes the operations of mechanical parts and the Mode Select Switch when the deck is in the Loading Operation. The loading operation described here applies not only in the PLAY mode but also the RECORDING mode.
Refer to Figures 1-22, 1-23, 1-24 and 1-25 for the description which follows.
When the unit is put into any one of the above listed modes, the Loading Motor (1) begins to rotate in forward direction.
The rotation of the loading motor is conveyed to the Cam Gear (7) via the Loading Belt-1 (2), Loading Intermediate Pulley (3), Loading Belt-2 (4), Large Pulley (5) and the Intermediate Gear (6).

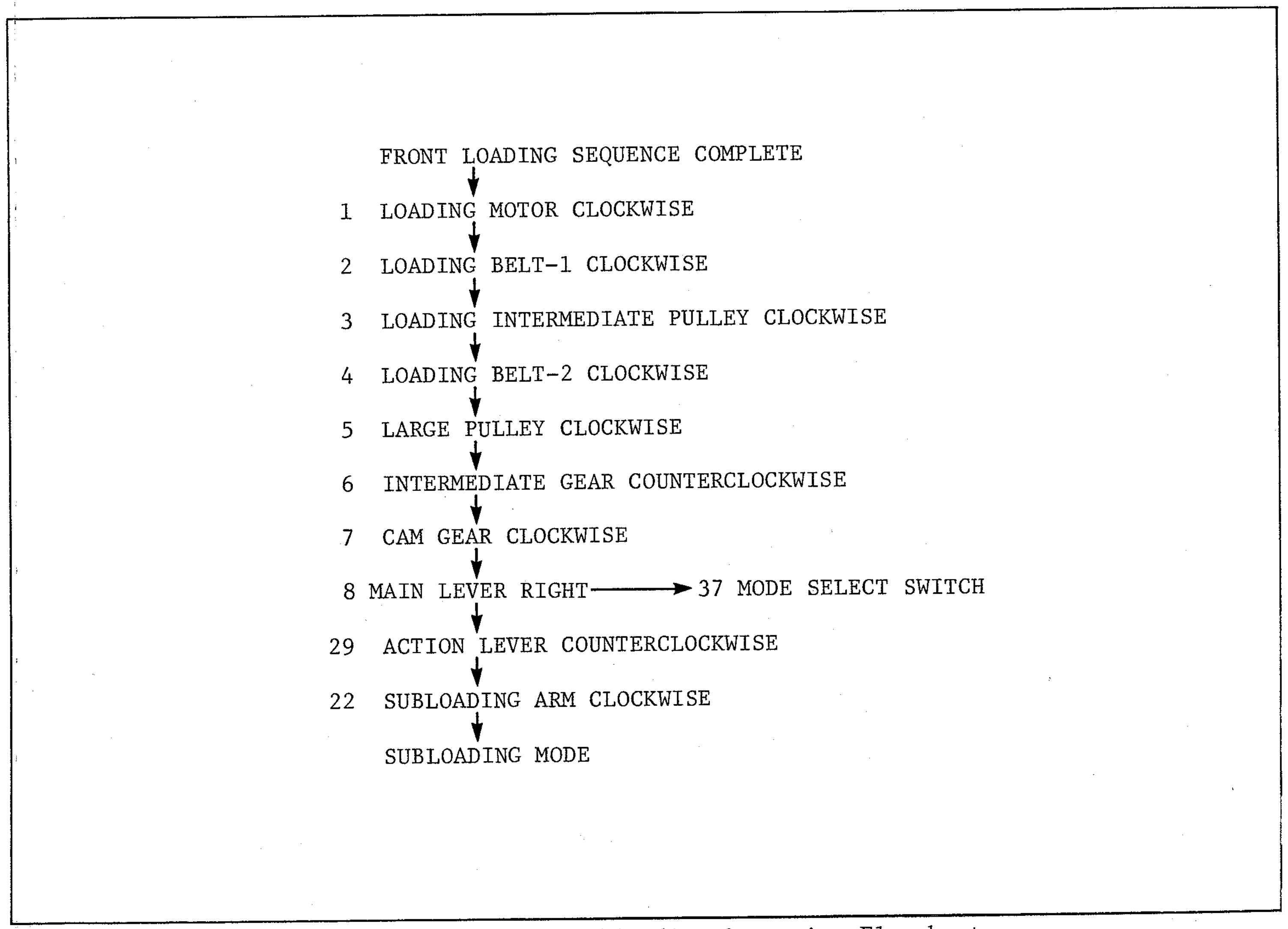

FRONT LOADING SEQUENCE COMPLETE
1 LOADING MOTOR CLOCKWISE
2 LOADING BELT-1 CLOCKWISE
3 LOADING INTERMEDIATE PULLEY CLOCKWISE
4 LOADING BELT-2 CLOCKWISE
5 LARGE PULLEY CLOCKWISE
6 INTERMEDIATE GEAR COUNTERCLOCKWISE
7 CAM GEAR CLOCKWISE
8 MAIN LEVER RIGHT
37 MODE SELECT SWITCH
29 ACTION LEVER COUNTERCLOCKWISE
22 SUBLOADING ARM CLOCKWISE
SUBLOADING MODE

Figure 1-21. Subloading Operation Flowchart.

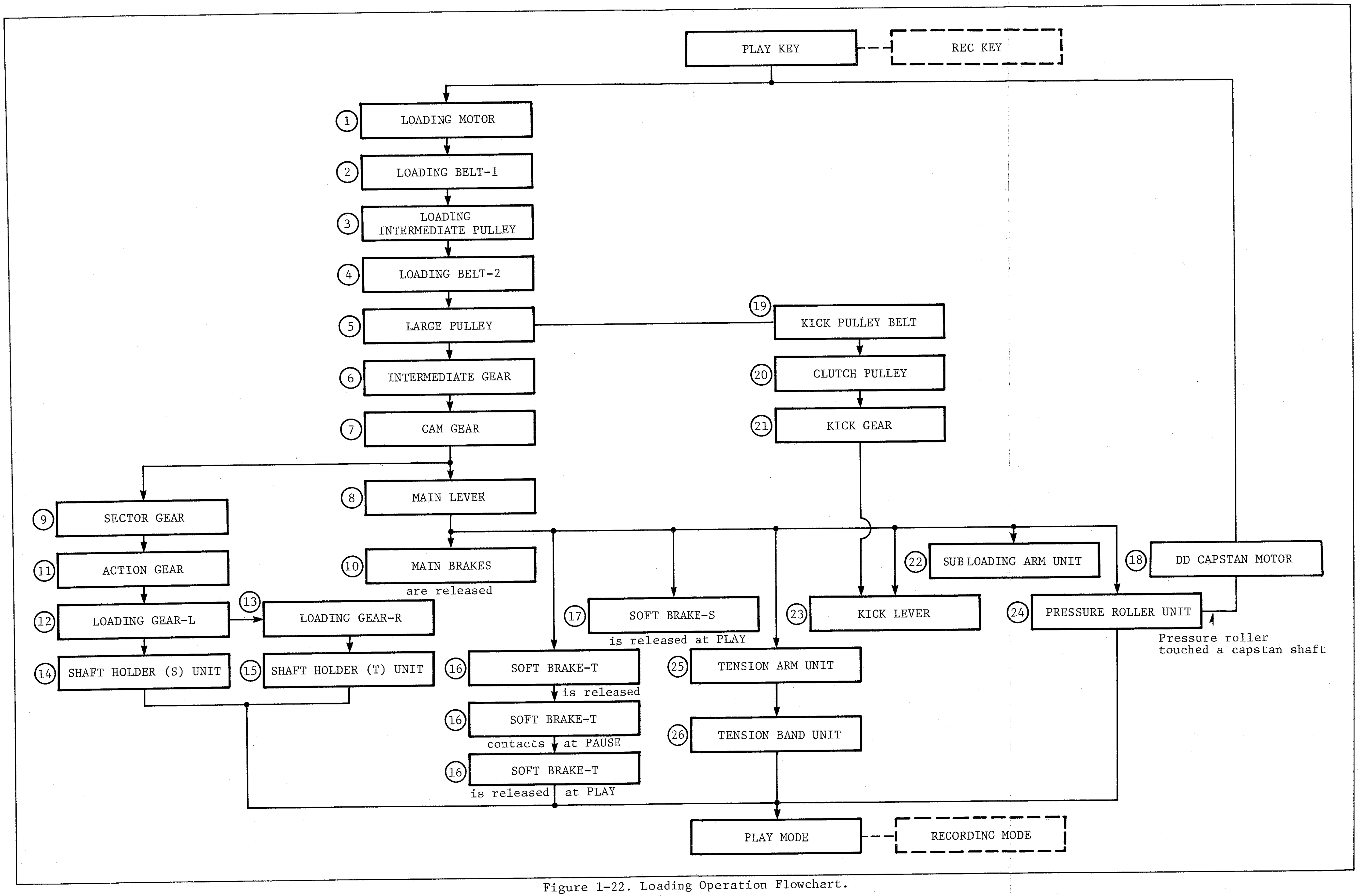

PLAY KEY
REC KEY
① LOADING MOTOR
② LOADING BELT-1
③ LOADING INTERMEDIATE PULLEY
④ LOADING BELT-2
⑤ LARGE PULLEY
⑥ INTERMEDIATE GEAR
⑦ CAM GEAR
⑧ MAIN LEVER
⑨ SECTOR GEAR
⑩ MAIN BRAKES
are released
⑪ ACTION GEAR
⑫ LOADING GEAR-L
⑬ LOADING GEAR-R
⑭ SHAFT HOLDER (S) UNIT
⑮ SHAFT HOLDER (T) UNIT
⑯ SOFT BRAKE-T
is released
⑯ SOFT BRAKE-T
contacts at PAUSE
⑯ SOFT BRAKE-T
is released at PLAY
⑰ SOFT BRAKE-S
is released at PLAY
⑱ DD CAPSTAN MOTOR
⑲ KICK PULLEY BELT
⑳ CLUTCH PULLEY
㉑ KICK GEAR
㉒ SUB LOADING ARM UNIT
㉓ KICK LEVER
㉔ PRESSURE ROLLER UNIT
Pressure roller touched a capstan shaft
㉕ TENSION ARM UNIT
㉖ TENSION BAND UNIT
PLAY MODE
RECORDING MODE

Figure 1-22. Loading Operation Flowchart.

The sector gear (9), which is engaged to the head side of the Cam Gear, rotates both the Loading Gear-L (12) and the Loading Gear-R (13) via the Action Gear (11). Then the Shaft Holder(S) Unit (14) and the Shaft Holder(T) Unit (15) are moved by the Loading Arm L and R which are linked to the Loading Gears L (12) and R (13) for loading. These simultaneous movements, originating from the Sector Gear, result in the loading of the tape.

At the same time, the Main Lever (8) which is engaged to the tail side of the Cam Gear, moves several parts while sliding in the LOADING direction.

As the Main Lever slides by about 11 mm in the LOADING direction the Main Brakes (10) rotate in the direction to release the braking condition.

The brake release occurs at the same time when the Sector Gear begins to move, in other works, when the tape begins to be loaded.

Next, let us follow the movements of the Soft Brake-T (16) located at the Takeup Reel and the Soft Brake-S (17) at the Supply Reel during the tape loading.

While the tape is being loaded, tape is first supplied from the Supply Reel when the tape reaches the DD cylinder, tape is supplied from both reels.

Therefore the Soft Brake-T is first released (off condition) and then just before the Mode Select Switch reaches the PAUSE position REV PAUSE pin 6, PLAY PAUSE pin 7, it contacts the Take-up Reel (on condition) to give the necessary tape tension. Finally, just before the Mode Select Switch reaches the PLAY position (pin 7), it is released again.

As is described above, tape feed from the Supply Reel is slightly delayed compared to tape feed from the Takeup side. The Soft Brake-S (17) also provides necessary tape tension while the tape is being loaded, and is released at the same time that the Soft Brake-T is released. This Soft Brake-S operates in two stages, a Soft Stage and a Hard Stage. The soft stage is effective in the FAST FORWARD/REWIND mode period, and the hard stage is effective in the rest of the period between STOP and PLAY. These two functions are mechanically switched by the Main Lever to give optimum tape tension in each mode.

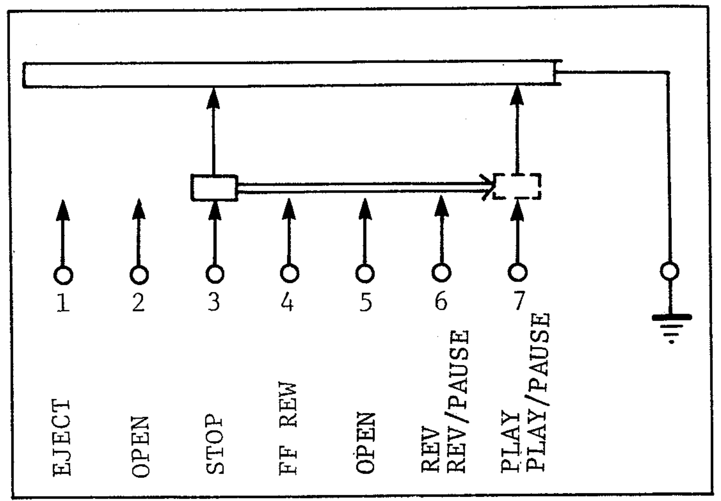


Figure 1-25. Movement of Mode Select Switch. (Loading)

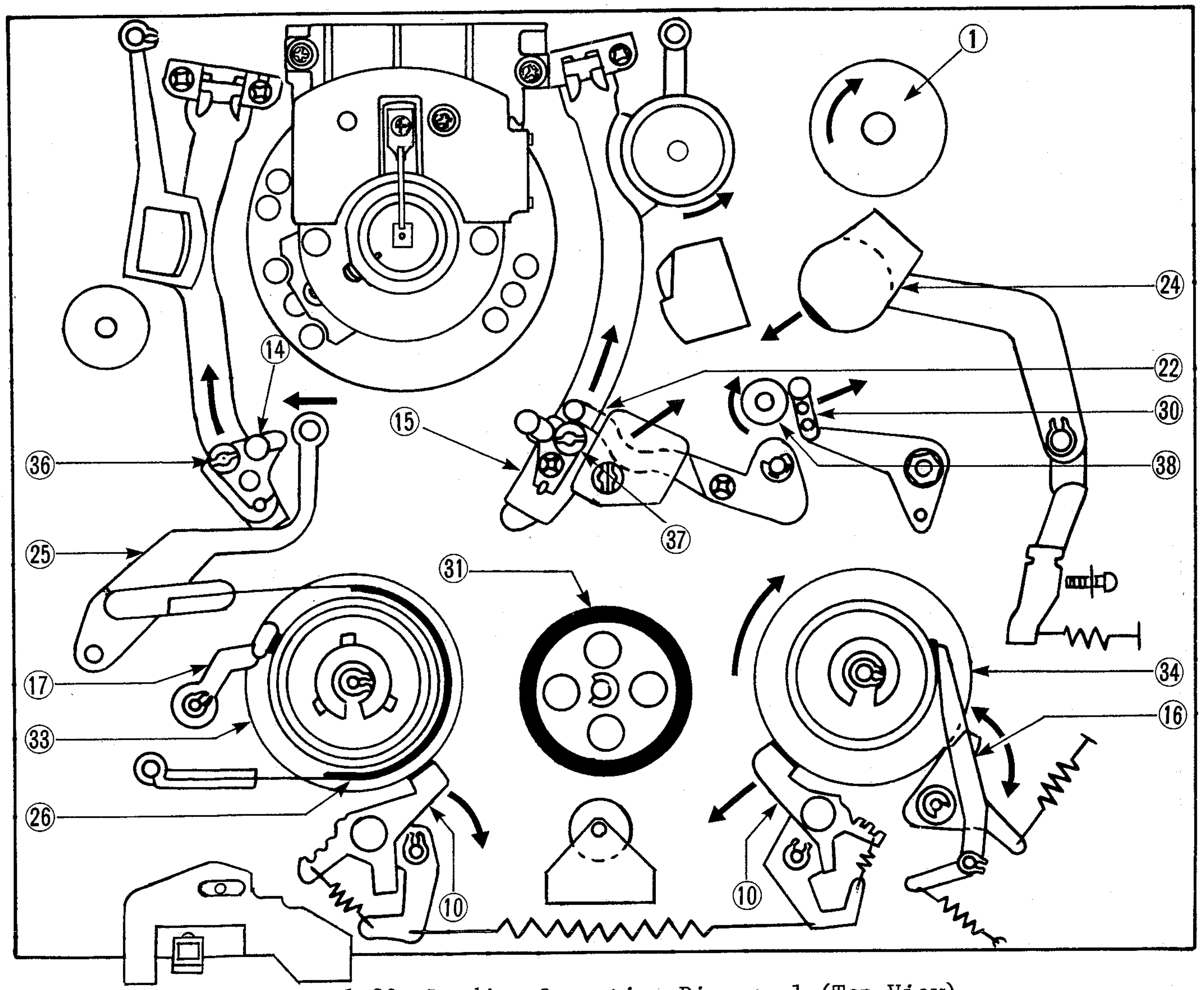


Figure 1-23. Loading Operation Diagram-1 (Top View).

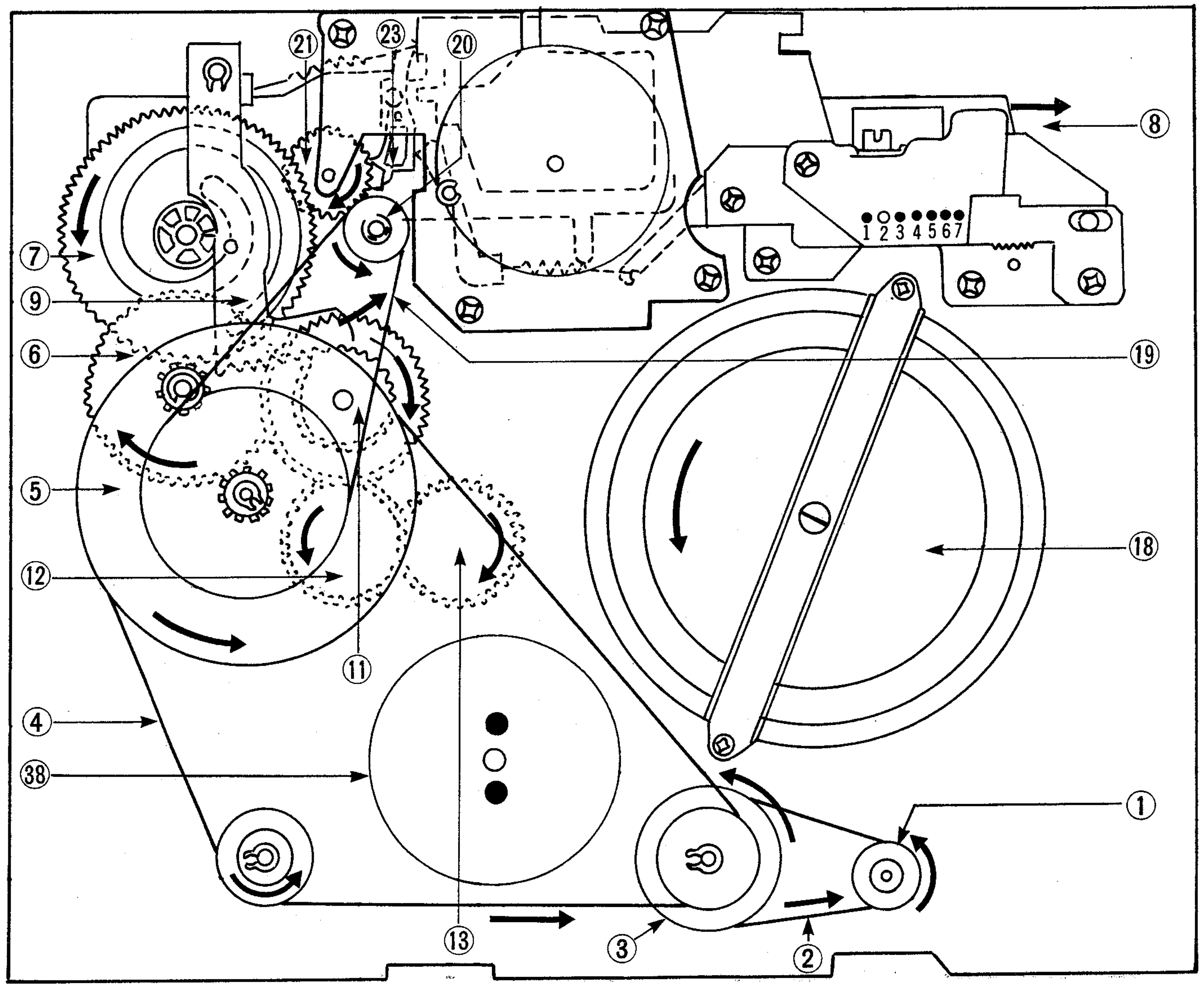


Figure 1-24. Loading Operation Diagram-2 (Bottom View).

Supply Reel Area Movements

Refer to the top view of the Loading Operation diagram (Figure 1-23). In the Supply Reel Area, a Tension Arm Unit (25) is set to move in a counterclockwise direction under spring tension. Therefore at the beginning of tape loading, this part follows the loading post-L (36) until it is stopped by a pin on the Main Lever. After this point, the Tension Arm Unit follows the movement of the Main Lever.
Finally, the Tension Arm Unit is fixed in the position which allows the Tension Band (26) to provide specified tape tension. (This occurs at the moment when both the Soft Brake-S and Soft Brake-T are released.)

Takeup Reel Area Movements

When the unit is first put into the Loading Operation, the Main Lever also moves parts in the Takeup Reel area. These are: the Soft Brake-T, Main Brake, Mode Select Switch, Pressure Roller Unit, and the Kick Lever. At the moment just before the Loading Completion (loading posts reach the V-stoppers), the Pressure Roller Unit (24) begins to be moved by the Main Lever (via a spring) to a position just before contact with the Capstan Shaft Unit (38).

(This moment corresponds to the PAUSE mode which is described in the next section.)

As the Main Lever continues to move in the LOAD direction, the Action Gear (11) rotates and drives the P5 arm (30) clockwise. With this movement, the Pressure Roller Unit (24) is also moved toward the DD Capstan Motor.
At this time, the Kick Lever (23) releases the Idler (31) which starts to move toward the Takeup Reel Table..
Finally, the Tension Arm Unit is moved counterclockwise, the Tension Band (26) contacts the Supply Reel Table, and the Soft Brake-S (17) is released.

In the above sequence, all parts move or rotate or slide toward the LOADING direction.

Now, the deck is ready for the PLAY and RECORDING mode. When the deck is in the RECORDING mode, the only difference from the PLAY mode is that the safety switch lever is pushed back by the tab on the cassette.

2-3-3. In the Pause/Still Operation when the Remote Controller Model AG-A600 is connected.

The Pause/Still Operation can be performed during two operating modes, the Record mode and the Play mode.
The Pause operation simply stops the tape travel.

2-3-4. Fast Forward Operation

This section describes the mechanical operation in the FAST FORWARD Mode. In this mode, the movement of the Mode Select Switch is from the STOP position to the FF/REW position. This means that most of the mechanical movements in the Fast Forward Mode and the Rewind Mode are the same. Refer to Figures 1-26, 1-27, 1-28 and 1-29.
When the FF key is pressed, the Loading Motor (1) begin to rotate in the forward direction. The rotating energy of the Loading Motor is conveyed to the Cam Gear (7) via the Loading Belt-1 (2), Loading Intermediate Pulley (3), Loading Belt-2 (4), Large Pulley (5) and the Intermediate Gear (6). As mentioned before, the Cam Gear moves the Main Lever (8).
When the Main Lever reaches a specified position, the Idler (31) which is in contact with the Reel Motor (32) also comes into contact with the Takeup Reel Table (34) and the Main Brake (10) of the Supply Reel Table is released.
Now, let us see the other operation performed by the Main Lever. The Mode Select Switch which is slid in the LOAD direction from the Stop position to the FF/REW position, stops the Loading Motor. Following the movement of the Main Lever, the Sub Lever is also slid in the same direction and this releases the Main Brakes (10) from both the Takeup Table (34) and Supply Reel Table (33).

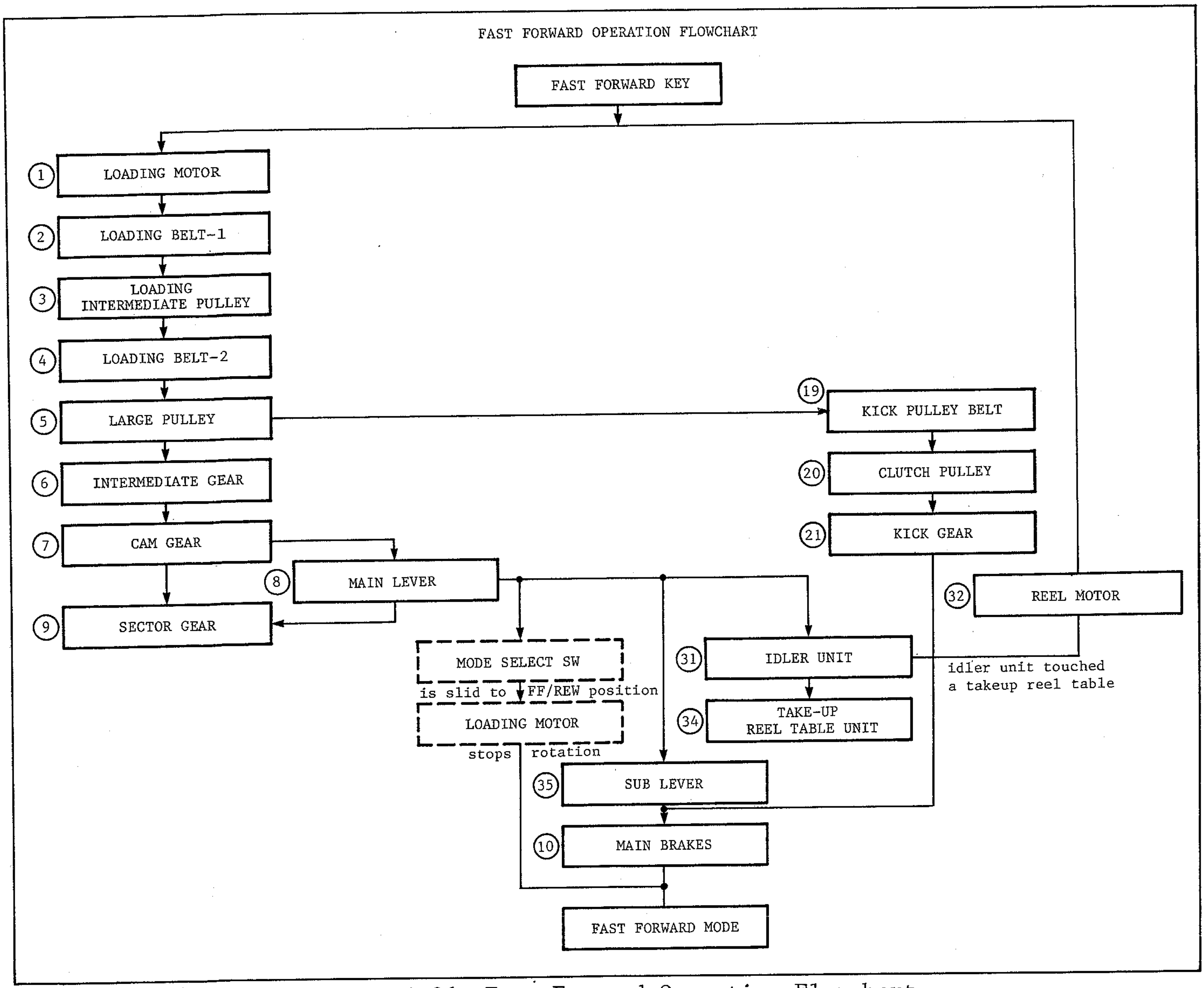

FAST FORWARD OPERATION FLOWCHART
FAST FORWARD KEY
① LOADING MOTOR
② LOADING BELT-1
③ LOADING INTERMEDIATE PULLEY
④ LOADING BELT-2
⑤ LARGE PULLEY
⑥ INTERMEDIATE GEAR
⑦ CAM GEAR
⑧ MAIN LEVER
⑨ SECTOR GEAR
⑲ KICK PULLEY BELT
⑳ CLUTCH PULLEY
㉑ KICK GEAR
㉜ REEL MOTOR
㉛ IDLER UNIT
㉞ TAKE-UP REEL TABLE UNIT
idler unit touched a takeup reel table
MODE SELECT SW
is slid to FF/REW position
LOADING MOTOR
stops rotation
㉟ SUB LEVER
⑩ MAIN BRAKES
FAST FORWARD MODE

Figure 1-26. Fast Forward Operation Flowchart.

The rotating energy of the Loading Motor is also conveyed to the Kick Gear (21) via the Clutch Pulley (20) and Kick Pulley Belt (19).

Then just before completion of movements by the Loading Motor, the Fast Wind Idler unit (31) is instantly kicked by the Kick Lever (23) toward the Take-up Reel Table. Now the Take-up Reel Table begins to rotate in the forward direction and takes up the tape. At this point, the deck is in the FAST FORWARD mode.

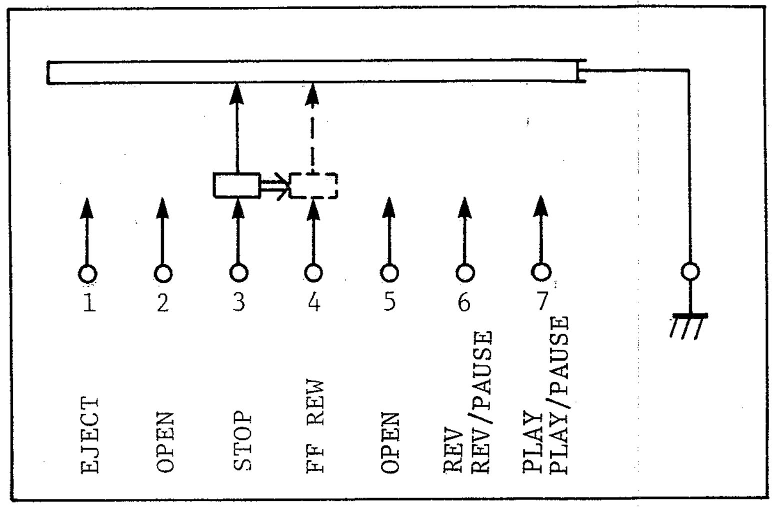

1
2
3
4
5
6
7
EJECT
OPEN
STOP
FF REW
OPEN
REV
REV/PAUSE
PLAY
PLAY/PAUSE

Figure 1-28. Movement of Mode Select Switch. (FF)

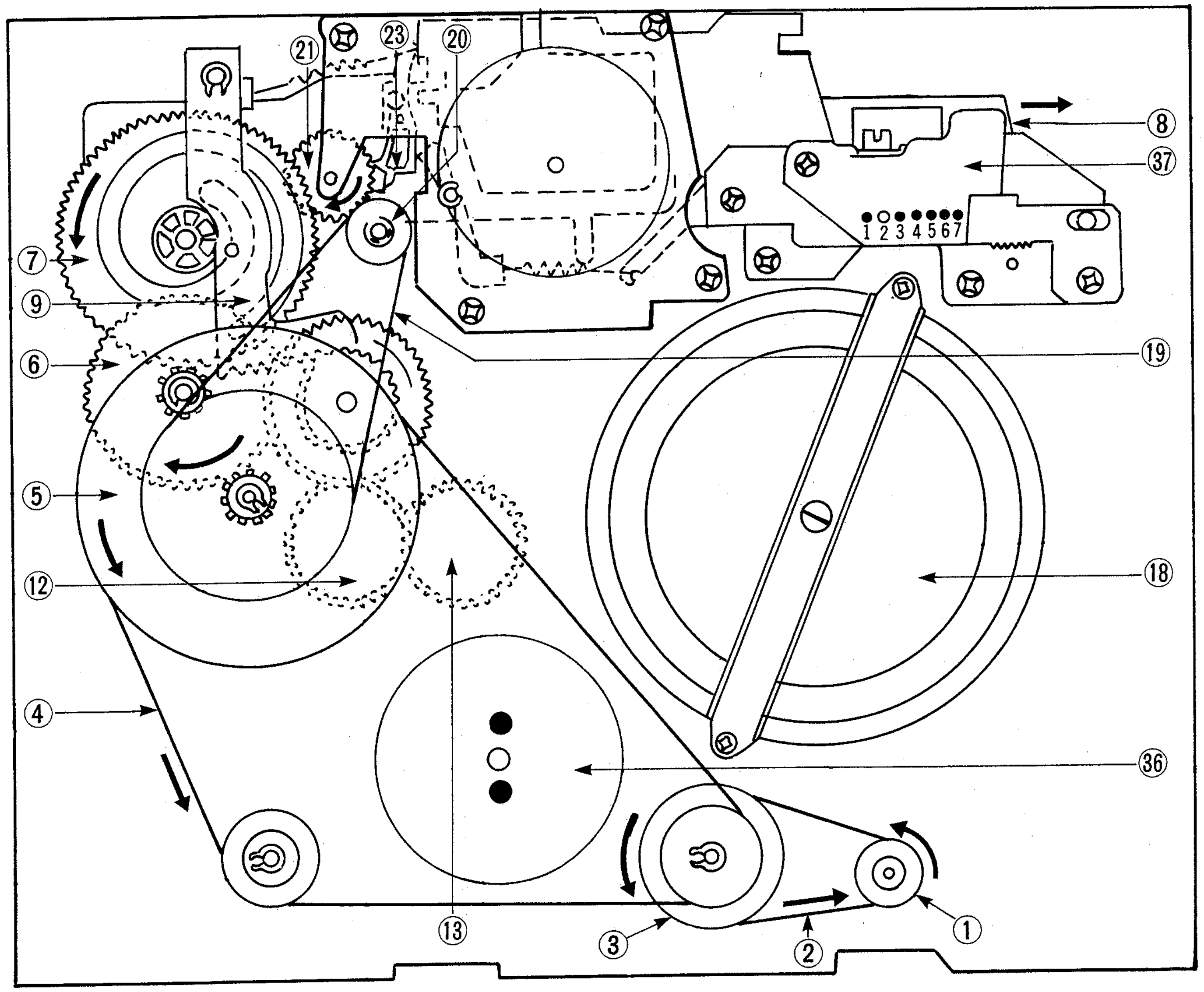
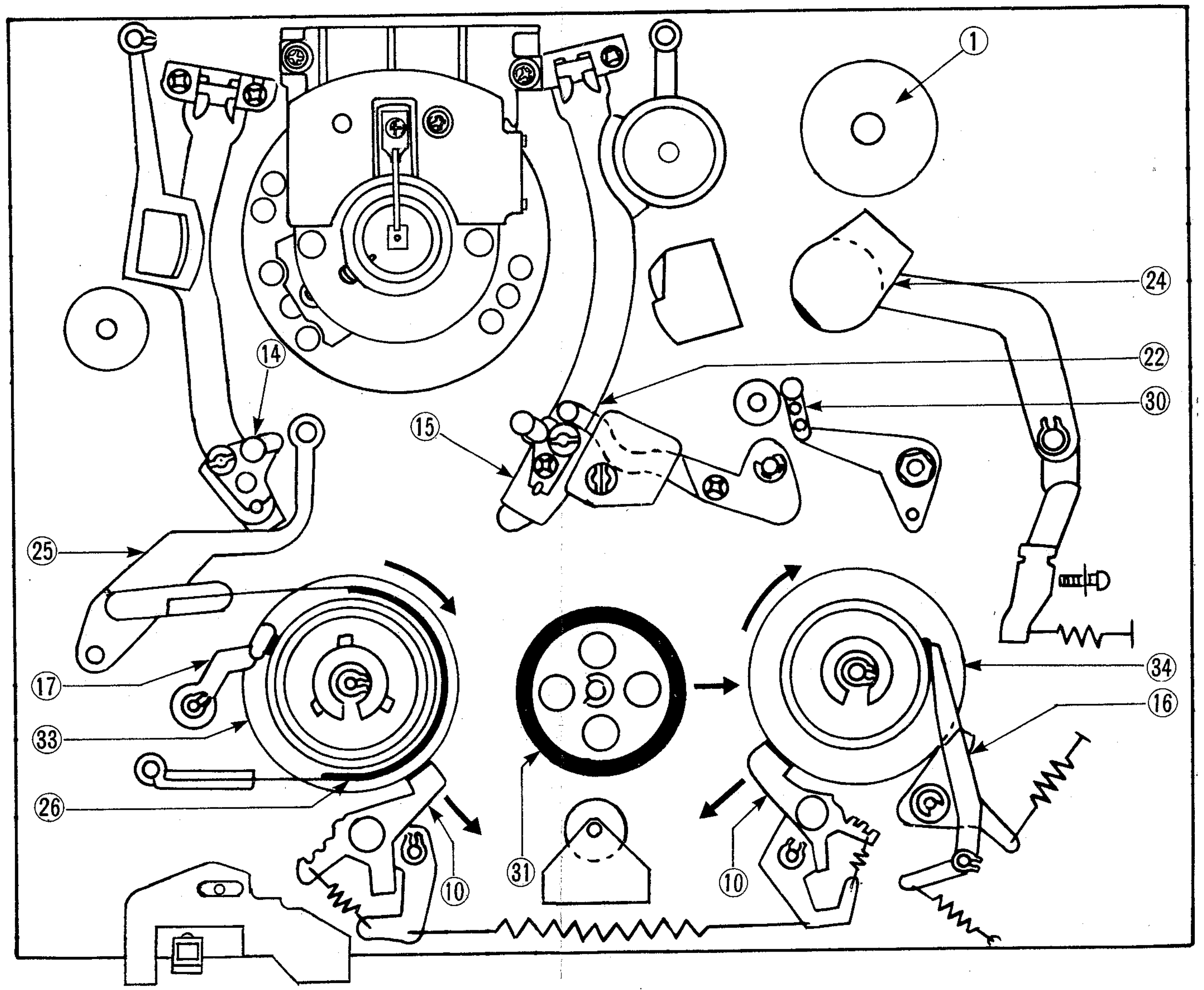

㉑
㉓
⑳
⑧
㊲
1 2 3 4 5 6 7
⑦
⑨
⑥
⑲
⑤
⑱
⑫
④
㊱
⑬
③
②
①

Figure 1-27. Fast Forward Operation Diagram-1 (Bottom View).


①
㉔
㉒
㉚
⑭
⑮
㉕
⑰
㉝
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⑩
㉛
⑩
㉞
⑯

Figure 1-29. Fast Forward Operation Diagram-2 (Top View).

2-3-5. Rewind Operation

This section describes the mechanical operation in the REWIND Mode. Most of the movements in this mode are the same as those in the FAST FORWARD Mode. Refer to Figure 1-30, 1-31, 1-32 and 1-33. The movements performed by the Loading Motor are exactly the same. This means that when the REWIND Key is pressed, the Loading Motor (1) begins to rotate in the forward direction. The rotating energy of the Loading Motor is conveyed to the Cam Gear (7) via the Loading Belt-1 (2), Loading Intermediate Pulley (3), Loading Belt-2 (4), large pulley (5) and the Intermediate Gear (6).

When the Loading motor rotates, the Main Lever is brought to the specified position. As a result, the Idler unit (31) comes into contact with the Supply Reel Table (33) and the Main Brakes (10) of the Takeup and Supply Reel Table is released. This movement is the same as in the Fast Forward operation.

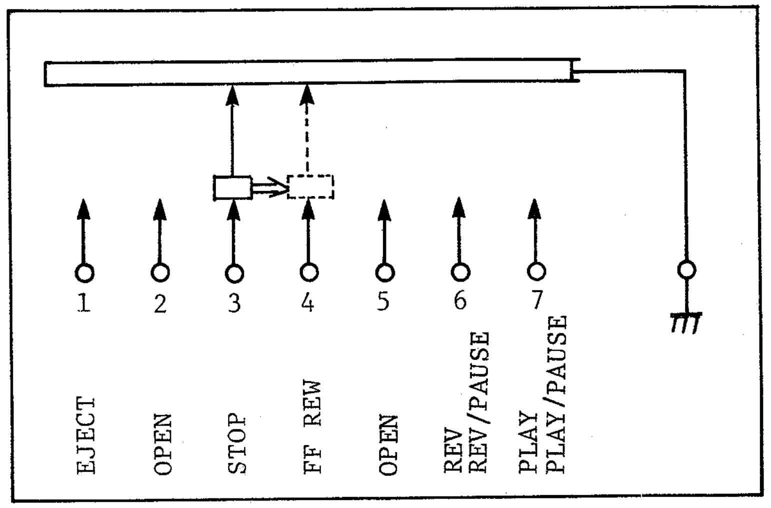

1
2
3
4
5
6
7
EJECT
OPEN
STOP
FF REW
OPEN
REV
REV/PAUSE
PLAY
PLAY/PAUSE

Figure 1-31. Movement of Mode Select Switch. (Rewind)

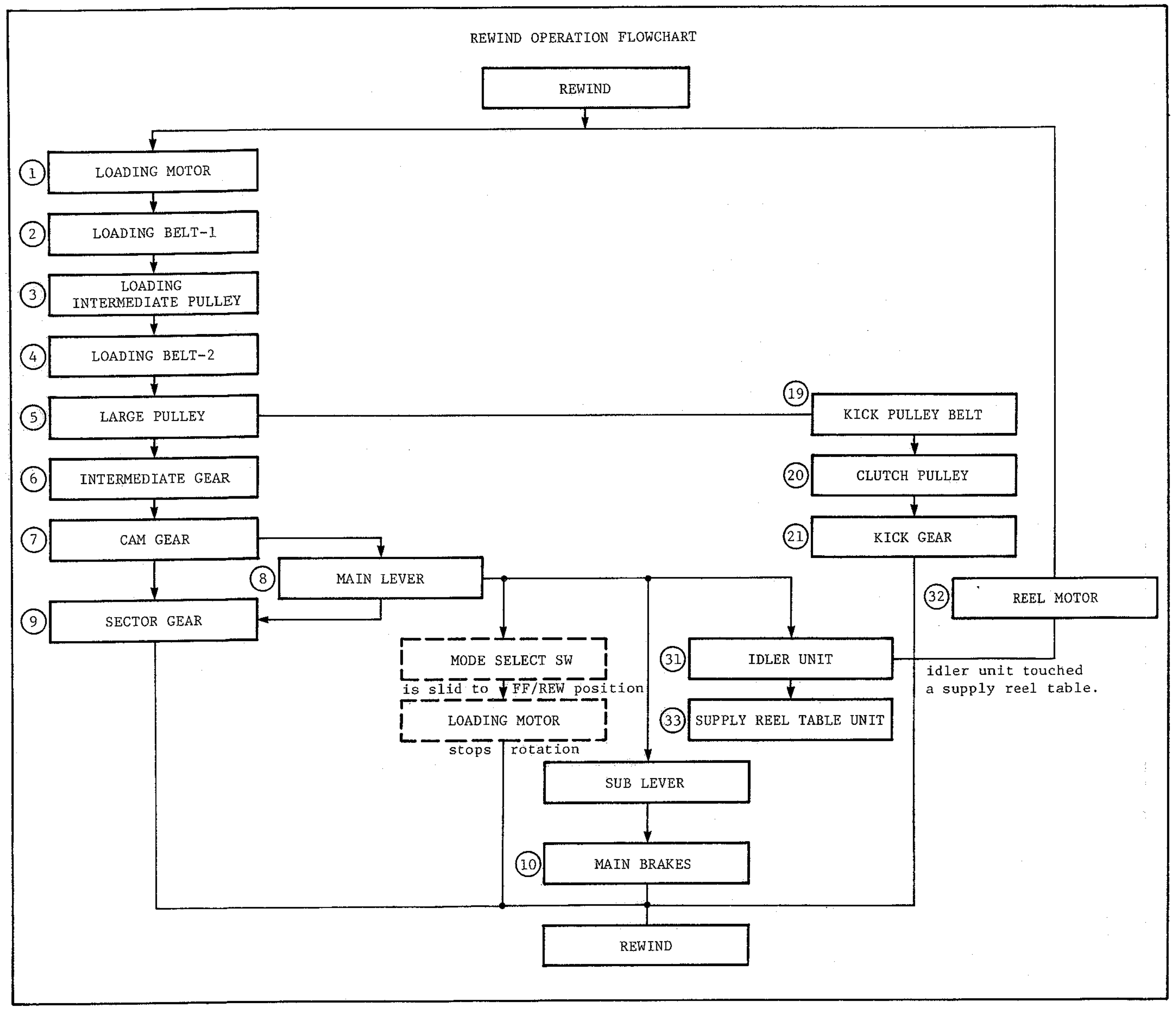
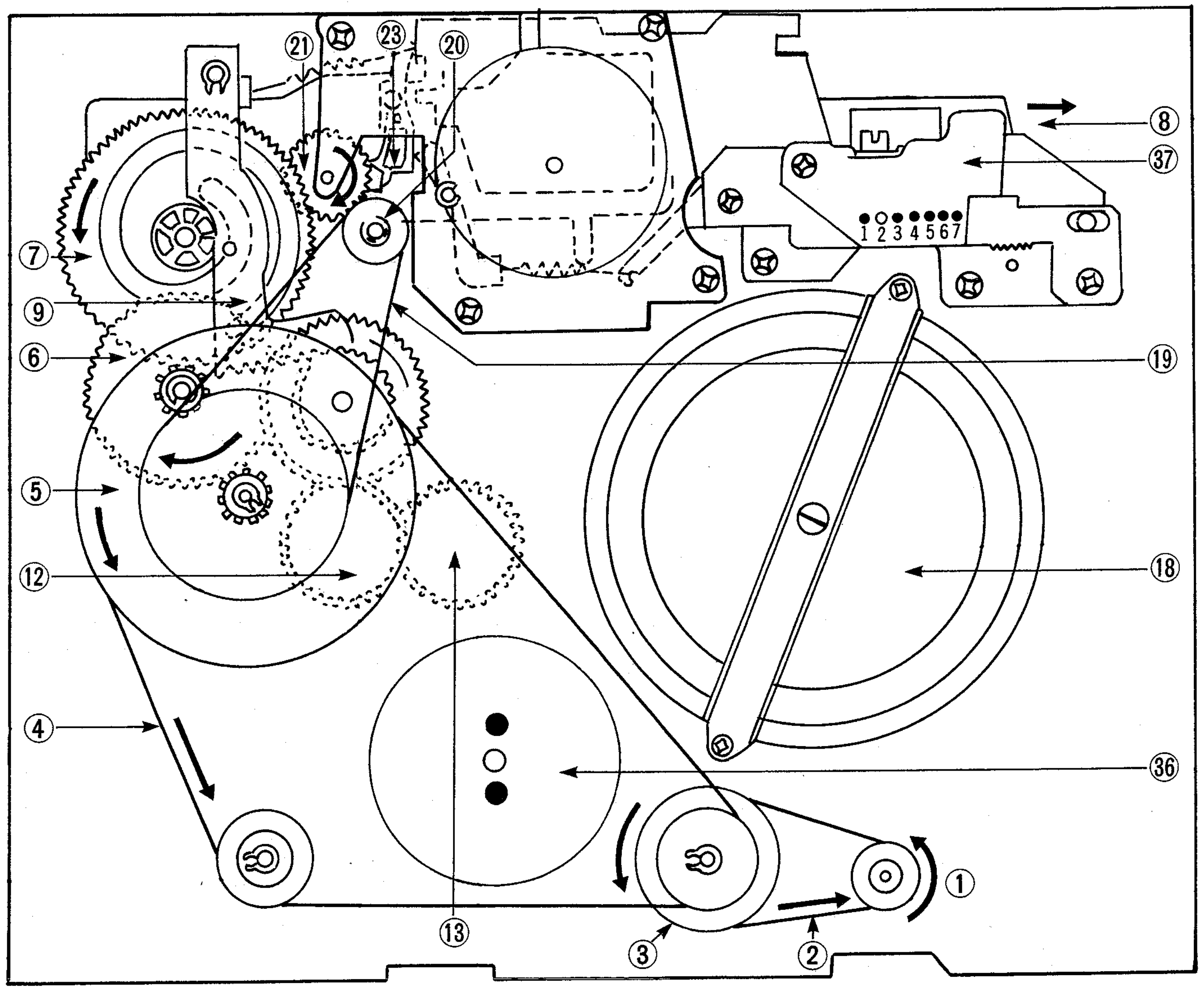

REWIND OPERATION FLOWCHART
REWIND
① LOADING MOTOR
② LOADING BELT-1
③ LOADING INTERMEDIATE PULLEY
④ LOADING BELT-2
⑤ LARGE PULLEY
⑥ INTERMEDIATE GEAR
⑦ CAM GEAR
⑧ MAIN LEVER
⑨ SECTOR GEAR
⑲ KICK PULLEY BELT
⑳ CLUTCH PULLEY
㉑ KICK GEAR
㉜ REEL MOTOR
MODE SELECT SW
is slid to FF/REW position
LOADING MOTOR
stops rotation
㉛ IDLER UNIT
㉝ SUPPLY REEL TABLE UNIT
idler unit touched
a supply reel table.
SUB LEVER
⑩ MAIN BRAKES
REWIND

Figure 1-30. Rewind Operation Flowchart.


㉑
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⑳
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㊲
1 2 3 4 5 6 7
⑦
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⑥
⑲
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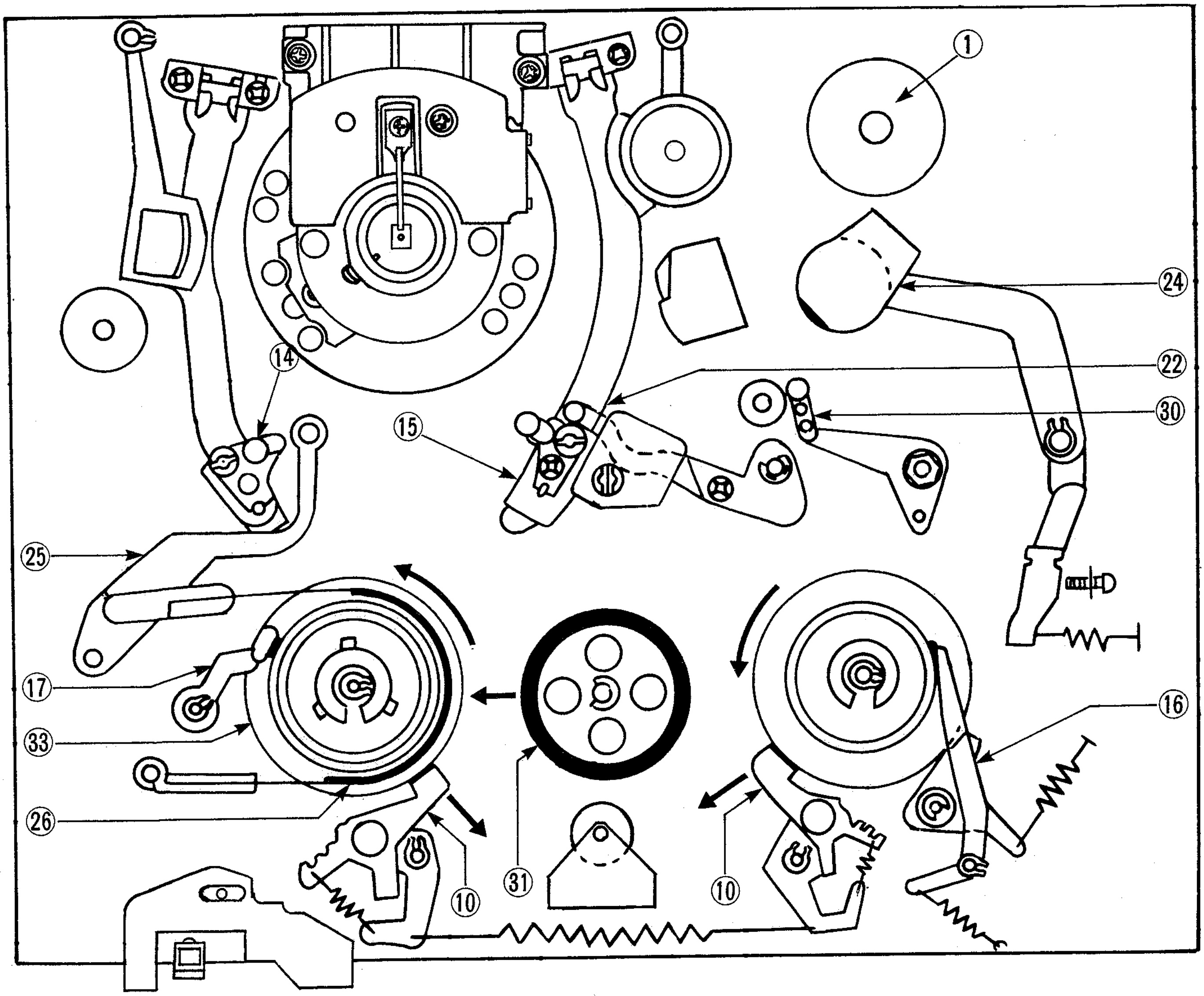
①

Figure 1-32. Rewind Operation Diagram-1 (Bottom View).


①
㉔
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⑮
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⑰
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⑩
㉛
⑩

Figure 1-33. Rewind Operation Diagram-2 (Top View).

2-3-6. In the Search Reverse when the Remote Controller Model AG-A600 is connected operation.

This section describes the mechanical operation in the Search Reverse Mode. (Refer to Figures 1-34 and 1-35). The Search Reverse operation is performed in the Play mode.
First, the Loading Motor (1) has a small pulley on its shaft which drives Loading Belt-1 (2). This turns the Loading Intermediate Pulley (3), which drives Loading Belt-2 (4) to turn the Large Pulley (5). This turns the Intermediate Gear (6) which in turn drives the Cam Gear (7).

Finally, the Main Lever (8) moves in the reverse direction to the left. Therefore, the Mode Select Switch (37) moves to the Search Reverse position (pin 6), and the Back Tension Band (26) is released.

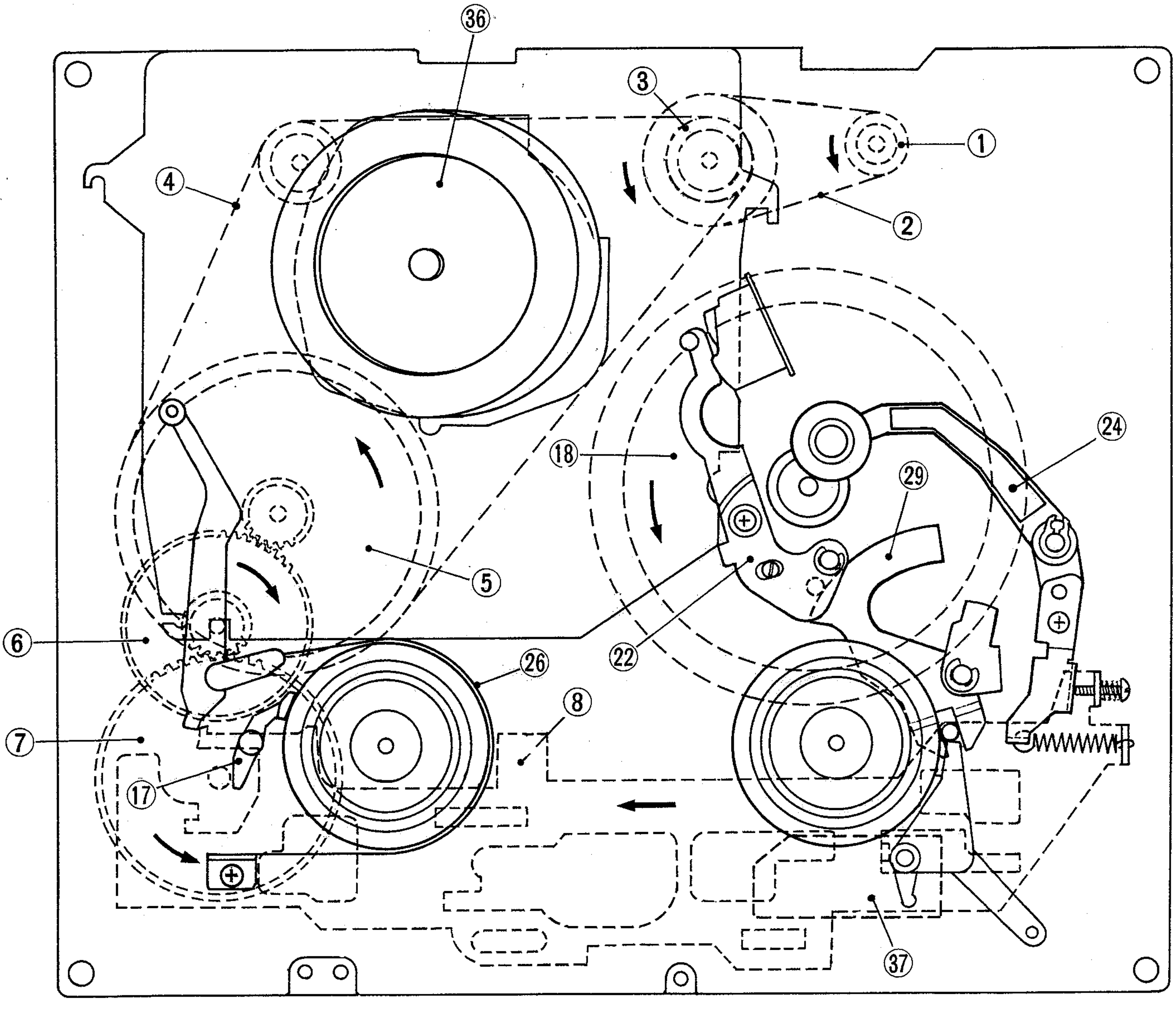


Figure 1-34. Search Reverse Operation Diagram.

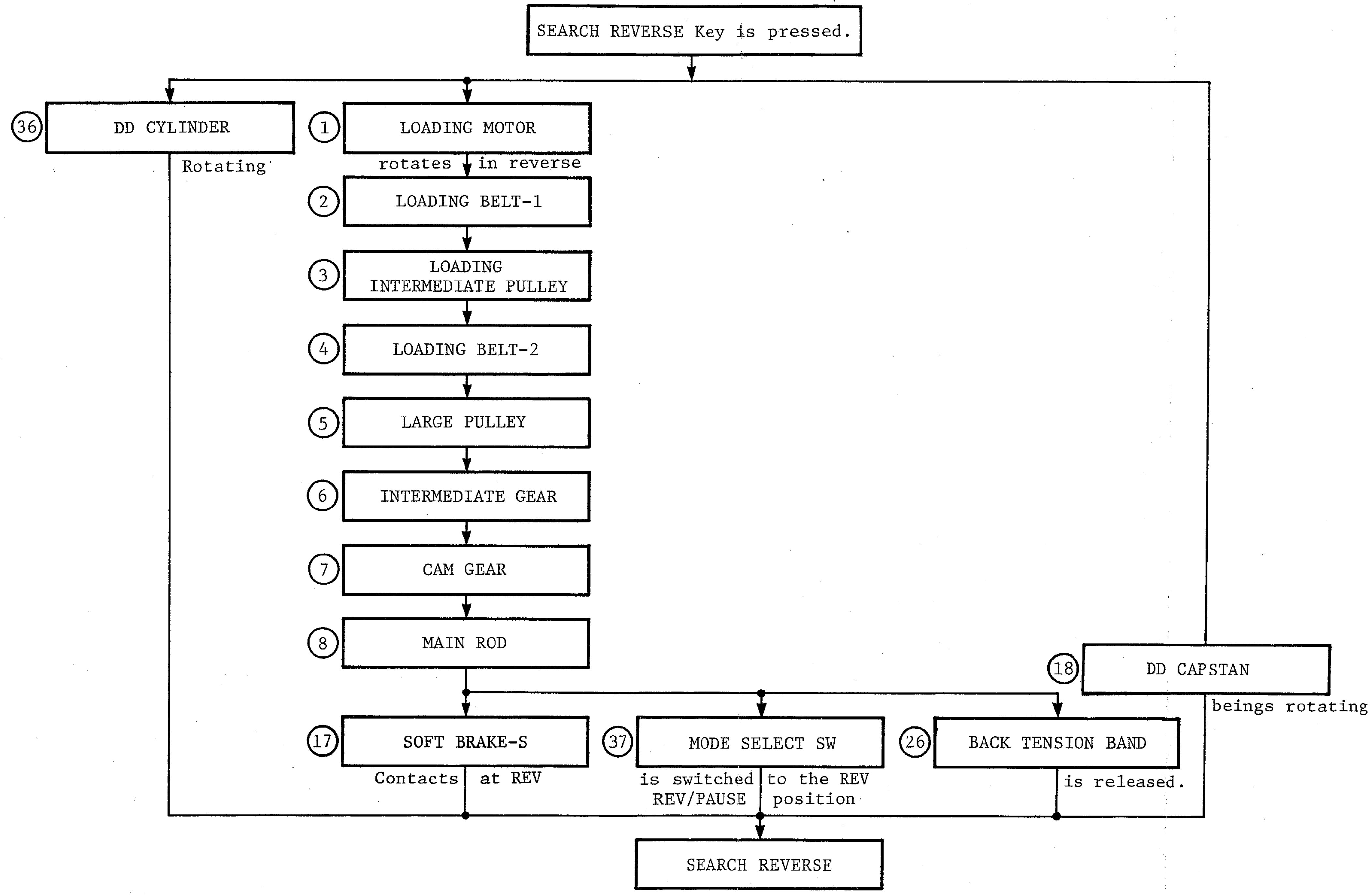

SEARCH REVERSE Key is pressed.
36
DD CYLINDER
Rotating
1
LOADING MOTOR
rotates in reverse
2
LOADING BELT-1
3
LOADING INTERMEDIATE PULLEY
4
LOADING BELT-2
5
LARGE PULLEY
6
INTERMEDIATE GEAR
7
CAM GEAR
8
MAIN ROD
18
DD CAPSTAN
beings rotating
17
SOFT BRAKE-S
Contacts at REV
37
MODE SELECT SW
is switched to the REV
REV/PAUSE position
26
BACK TENSION BAND
is released.
SEARCH REVERSE

Figure 1-35. Search Reverse Operation Flowchart.

2-3-7. Unloading Operation

This section describes the mechanical operation performed when the Stop key is pressed in the PLAY Mode, RECORD Mode (in AG-6800), or in the Pause/Still Mode (Rec/Pause,Play/Pause) when the remote controller AG-A600 is connected.

Basically the unloading operation can be explained as the reverse movements of loading, which was previously described. (Refer to Figures 1-36 and 1-38.)

When the Stop key is pressed, the DD Capstan Motor (18) stops, and the Loading Motor (1) begins to rotate in the reverse direction, and turns the Cam Gear (7) via the Loading Belt-1 (2), Loading Intermediate Pulley (3), Loading Belt-2 (4), Large Pulley (5) and the Intermediate Gear (6). Then the Cam Gear moves the Sector Gear (9) and the Main Lever (8).

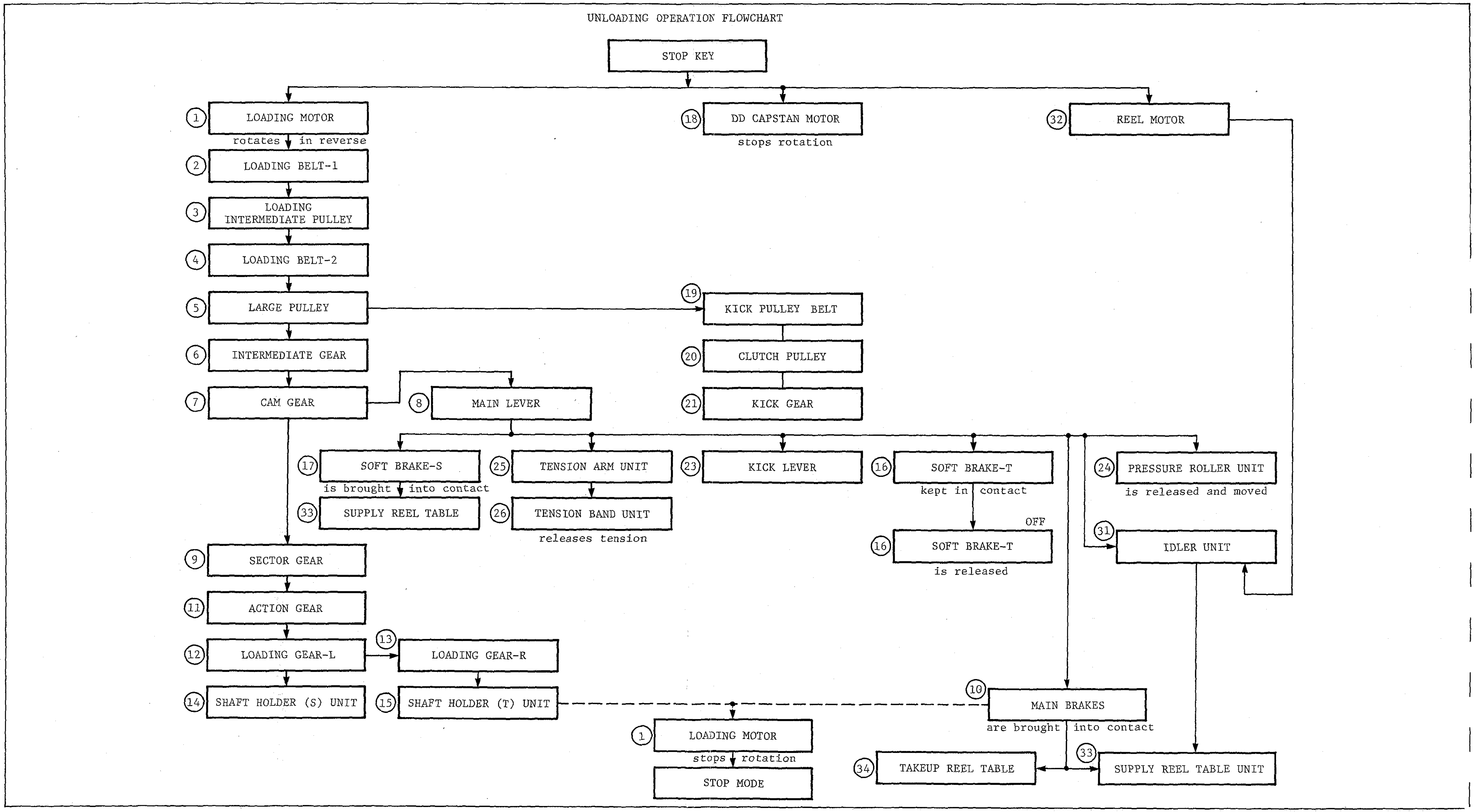

UNLOADING OPERATION FLOWCHART
STOP KEY
① LOADING MOTOR
rotates in reverse
② LOADING BELT-1
③ LOADING INTERMEDIATE PULLEY
④ LOADING BELT-2
⑤ LARGE PULLEY
⑥ INTERMEDIATE GEAR
⑦ CAM GEAR
⑧ MAIN LEVER
⑨ SECTOR GEAR
⑪ ACTION GEAR
⑫ LOADING GEAR-L
⑬ LOADING GEAR-R
⑭ SHAFT HOLDER (S) UNIT
⑮ SHAFT HOLDER (T) UNIT
⑱ DD CAPSTAN MOTOR
stops rotation
⑲ KICK PULLEY BELT
⑳ CLUTCH PULLEY
㉑ KICK GEAR
㉜ REEL MOTOR
⑰ SOFT BRAKE-S
is brought into contact
㉝ SUPPLY REEL TABLE
㉕ TENSION ARM UNIT
㉖ TENSION BAND UNIT
releases tension
㉓ KICK LEVER
⑯ SOFT BRAKE-T
kept in contact
OFF
⑯ SOFT BRAKE-T
is released
㉔ PRESSURE ROLLER UNIT
is released and moved
㉛ IDLER UNIT
⑩ MAIN BRAKES
are brought into contact
① LOADING MOTOR
stops rotation
STOP MODE
㉞ TAKEUP REEL TABLE
㉝ SUPPLY REEL TABLE UNIT

Figure 1-36. Unloading Operation Flowchart.

Now, let us follow the movements controlled by the Sector Gear. The sector gear rotates both the Loading Gear-R (13) and the Loading Gear-L (12) via the Action Gear (11). Then the Shaft Holder (S) unit (14) and the Shaft Holder(T) unit (15) are moved by the Loading Arm L and R linked to the Loading Gear L and R for the tape unloading. These simultaneouse movements from the Sector Gear result in the unloading of the tape from around the Cylinder.

Next, let us follow the movements controlled by the Main Lever. First, the Soft Brake-S (17) is brought into contact with the Supply Reel Table. At the same time the gear mounted at the lower portion of the Supply Reel Table starts rotation. This condition lasts until the unloading operation is completed.
Second, the Tension Arm Unit (25) is moved to release tape tension. The first half of its travel is performed by the Main Lever and the last half is performed by the Loading Post-L (36).

Third, the Main Brakes (10) are brought into contact with both the Supply and Takeup Reel tables just before unloading operation is completed.
Fourth, the Soft Brake-T (16) is moved. At the beginning of the unloading operation, this part is kept in contact with the Takeup Reel table. Then, when the Loading Posts begin to move, this is released and stays released until the unloading operation is completed.

Finally, let us follow the movements of the Pressure Roller Unit (24) and the Idler Unit (31).
The Main Lever, moves the Pressure Roller Unit (24) and the spring (40) so that the Pressure Roller Unit is released from the Capstan Shaft toward its desired position.
When the moving plate inside the Mode Select Switch reaches the Stop position, the Loading Motor stops, the deck goes to the STOP condition, and the unloading operation is completed.

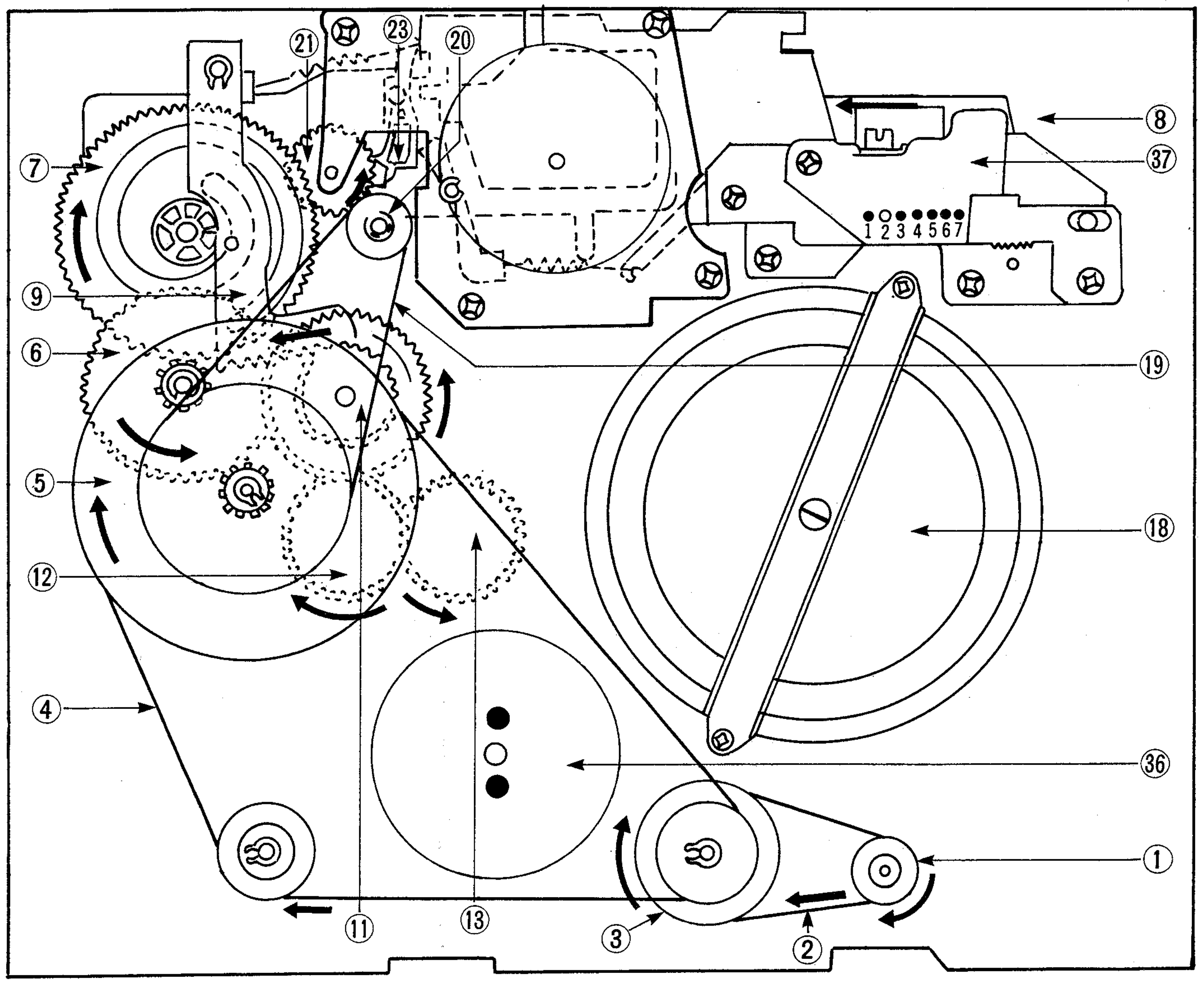


Figure 1-37. Unloading Operation Diagram-1 (Bottom View)

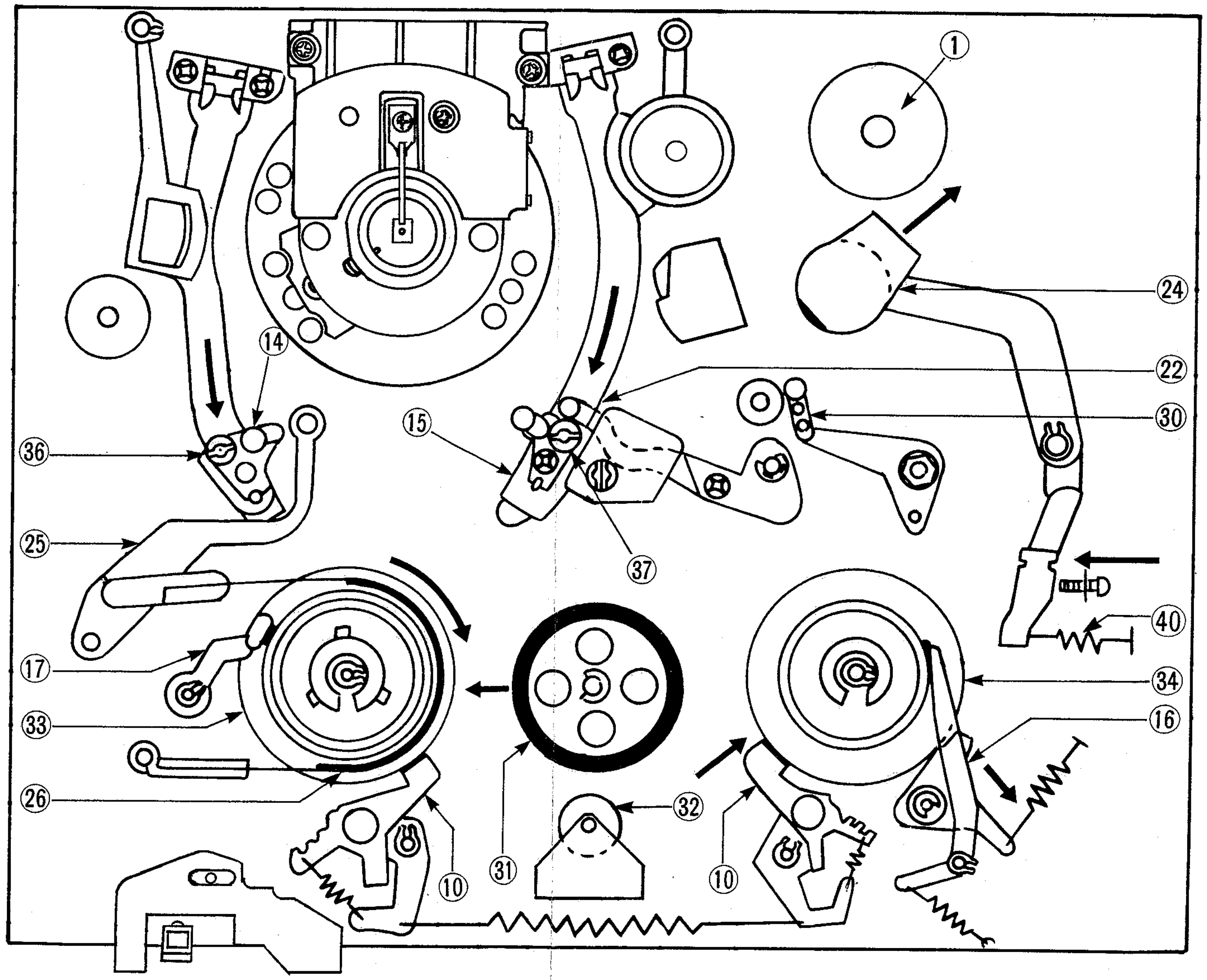


Figure 1-38. Unloading Operation Diagram-2 (Top View).

2-3-8. Eject Operation (Stop to Eject)

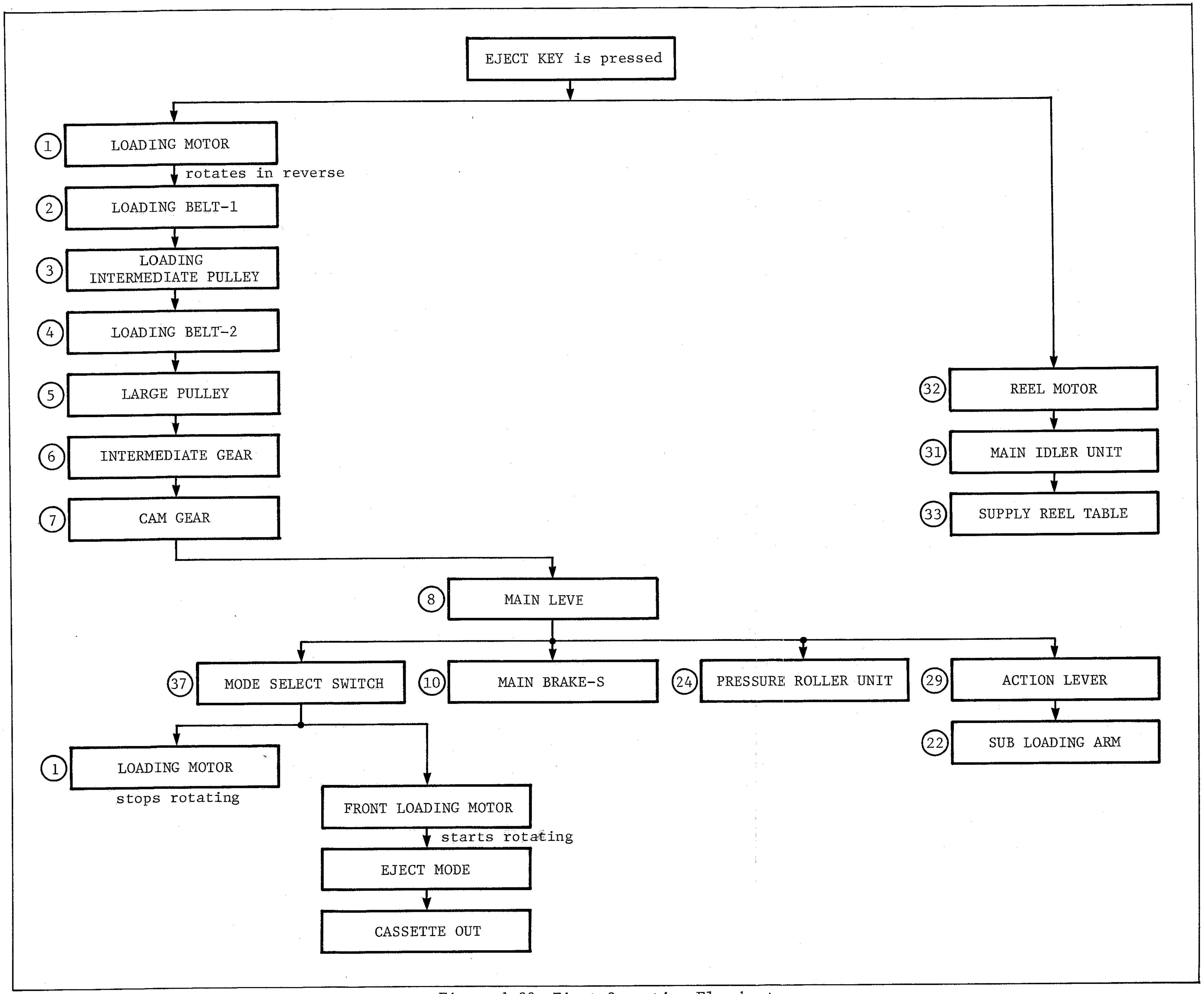

EJECT KEY is pressed
① LOADING MOTOR
rotates in reverse
② LOADING BELT-1
③ LOADING INTERMEDIATE PULLEY
④ LOADING BELT-2
⑤ LARGE PULLEY
⑥ INTERMEDIATE GEAR
⑦ CAM GEAR
⑧ MAIN LEVE
㊲ MODE SELECT SWITCH
⑩ MAIN BRAKE-S
㉔ PRESSURE ROLLER UNIT
㉙ ACTION LEVER
㉒ SUB LOADING ARM
㉜ REEL MOTOR
㉛ MAIN IDLER UNIT
㉝ SUPPLY REEL TABLE
① LOADING MOTOR
stops rotating
FRONT LOADING MOTOR
starts rotating
EJECT MODE
CASSETTE OUT

Figure 1-39. Eject Operation Flowchart.

The Eject operation is performed when the Eject key is pressed, regardless of the mode at the time.
Since the Eject operation cannot be performed if the Stop signal is not supplied from the Mode Select Switch, this section will describe the movements performed after the transport mechanism has reached the Stop position.
When the Eject key is pressed, the Loading Motor (1) and the Reel Motor (32) begin operation.
Refer to Figures 1-39, 1-40 and 1-41.
The Loading Motor (1) begins rotating in the unloading direction, and rotates the Cam Gear (7) as described in the Unloading Operation above.
The Cam Gear then moves the Main Lever (8), which moves the Subloading Arm (22) via the Action Lever (29).
The Reel Motor (32) then rotates the Main Idler Unit (31), which rotates the Supply Reel Table (33) to eliminate any tape looseness.
At the same time, the Main Lever (8) moves the Main Brakes (10), Pressure Roller Unit (24) and the Mode Select Switch (37).
The last movement of the Main Lever (8) in the unloading direction causes the Front Loading Motor to rotate and eject the cassette.

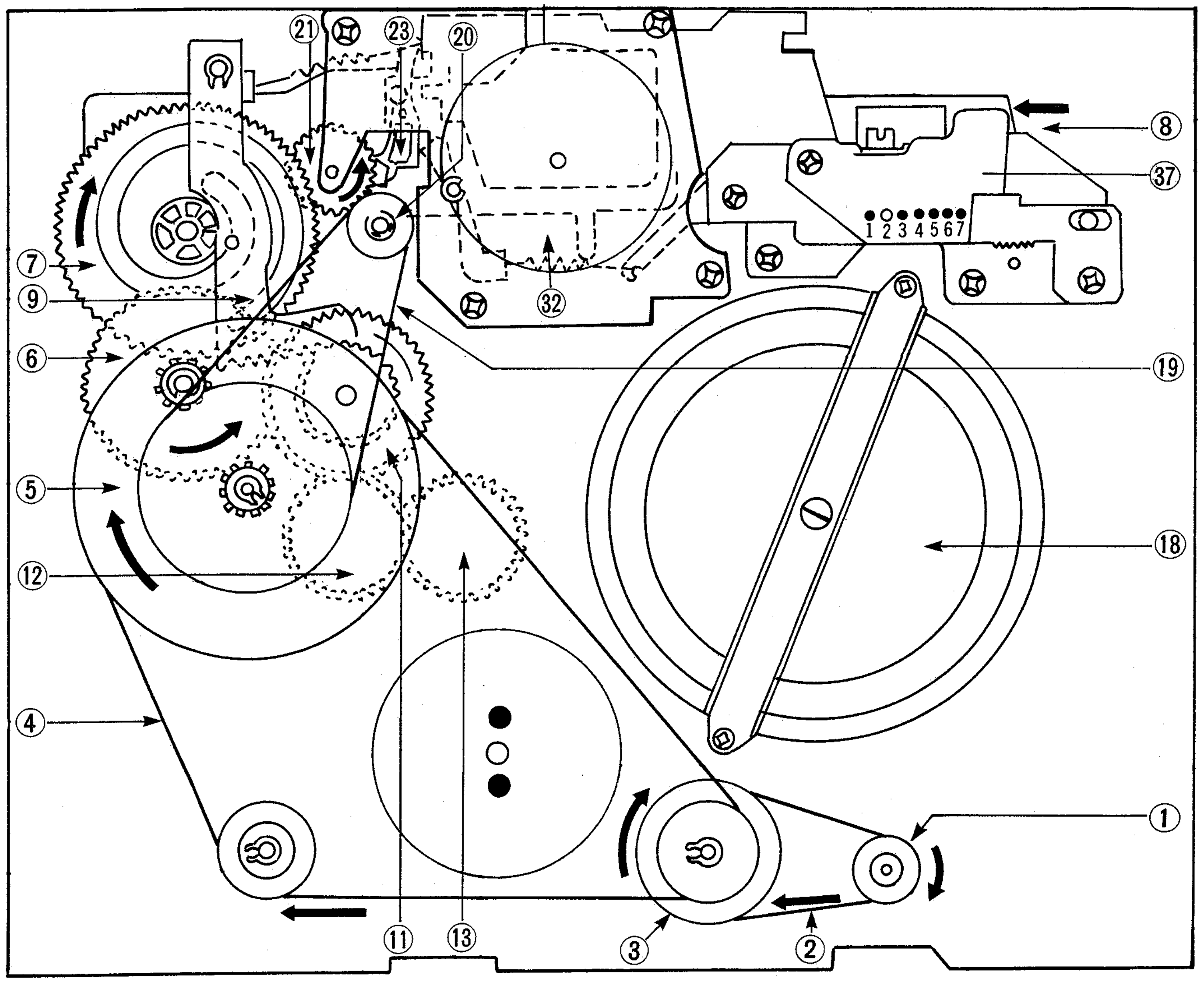

㉑
㉓
⑳
⑧
㊲
1 2 3 4 5 6 7
⑦
⑨
⑥
⑤
⑫
④
⑲
⑱
㉜
①
⑪
⑬
③
②

Figure 1-40. Eject Operation Diagram-1 (Bottom View).

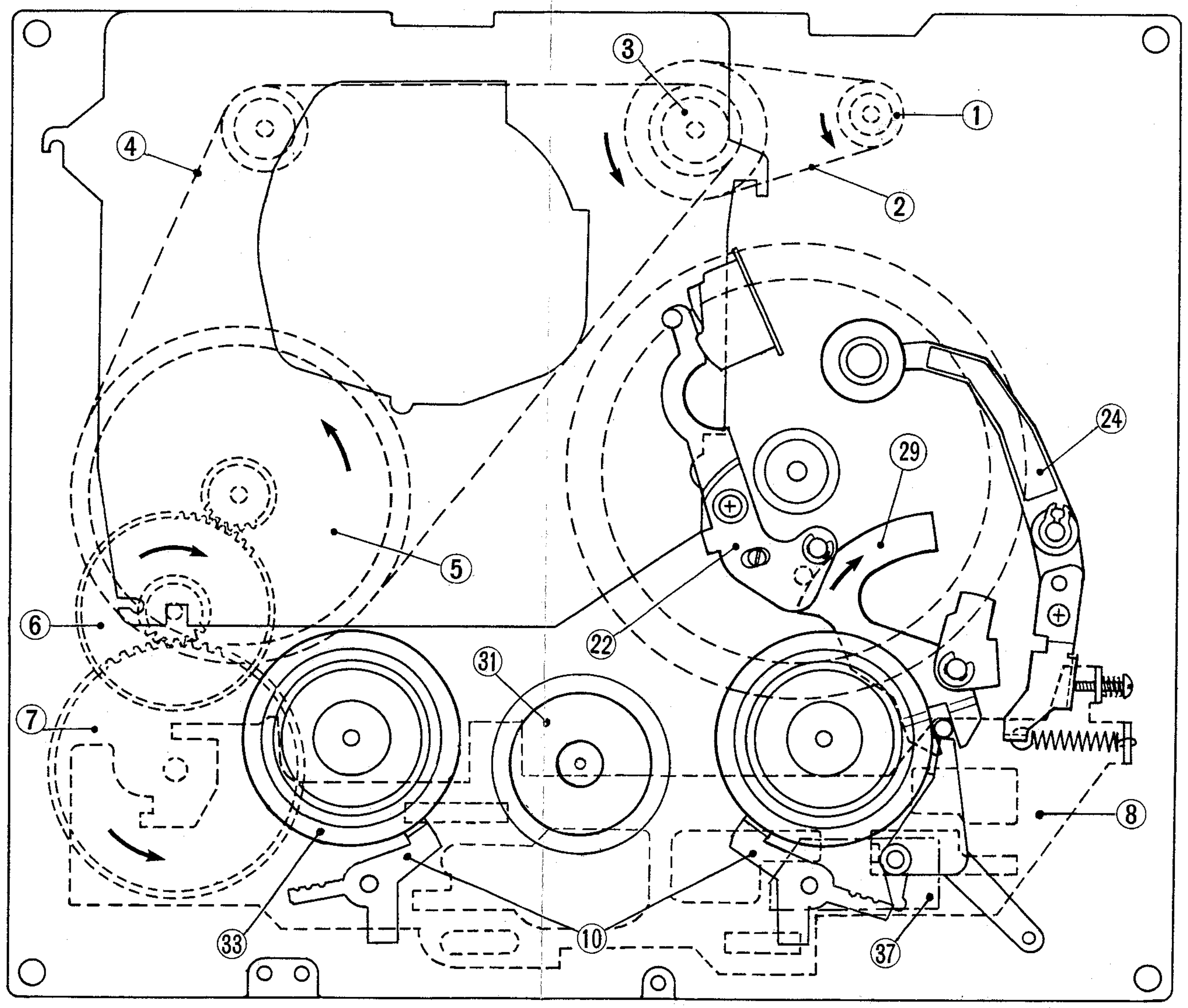

③
①
④
②
㉔
㉙
⑤
⑥
㉒
㉛
⑦
⑧
㉝
⑩
㊲

Figure 1-41. Eject Operation Diagram-2 (Top View).

CIRCUIT DESCRIPTION
SYSTEM CONTROL CIRCUIT

System Control of the AG-6800 is provided by a multiple microcomputer system of five microcomputer IC's which are linked together by a serial transmission bus (See Figure 2-1 and 2-2).

Introduction

The multiple microcomputer system provides for the recognition of inputs from the front panel switches, the internal transport status, and the remote control connector, and generates all the output signals for transport mechanism control, the tape time display, the remaining tape time indicator, and the servo mode/speed selection.

Description of Microcomputer

Two of the microcomputers (used by the system control and the counter) are the type NEC μPD1512, while the remaining three microcomputers are NEC μPD1511. Both are four bit high performance devices which include program memory, data moemory, I/O ports, shift/timer resistor, event counter, PLA (programmable logic array) control circuit, and clock oscillator circuit.
The block diagram and pin assignment are shown in Figure 2-3, and the I/O table is given in Figure 2-4.

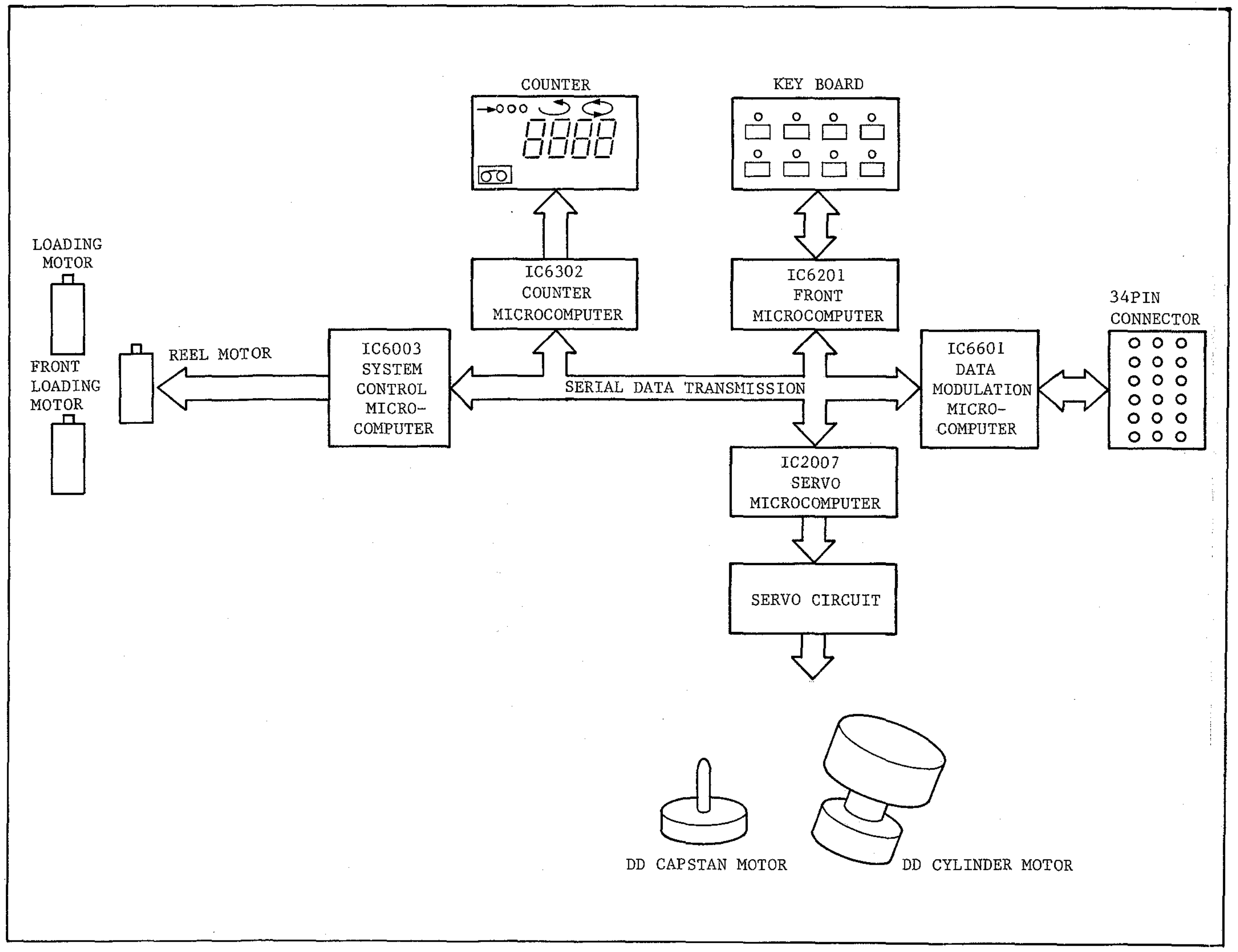

COUNTER
KEY BOARD
IC6302
COUNTER
MICROCOMPUTER
IC6201
FRONT
MICROCOMPUTER
LOADING
MOTOR
FRONT
LOADING
MOTOR
REEL MOTOR
IC6003
SYSTEM
CONTROL
MICRO-
COMPUTER
SERIAL DATA TRANSMISSION
IC6601
DATA
MODULATION
MICRO-
COMPUTER
34PIN
CONNECTOR
IC2007
SERVO
MICROCOMPUTER
SERVO CIRCUIT
DD CAPSTAN MOTOR
DD CYLINDER MOTOR

Figure 2-1. Multiple Microcomputer System.

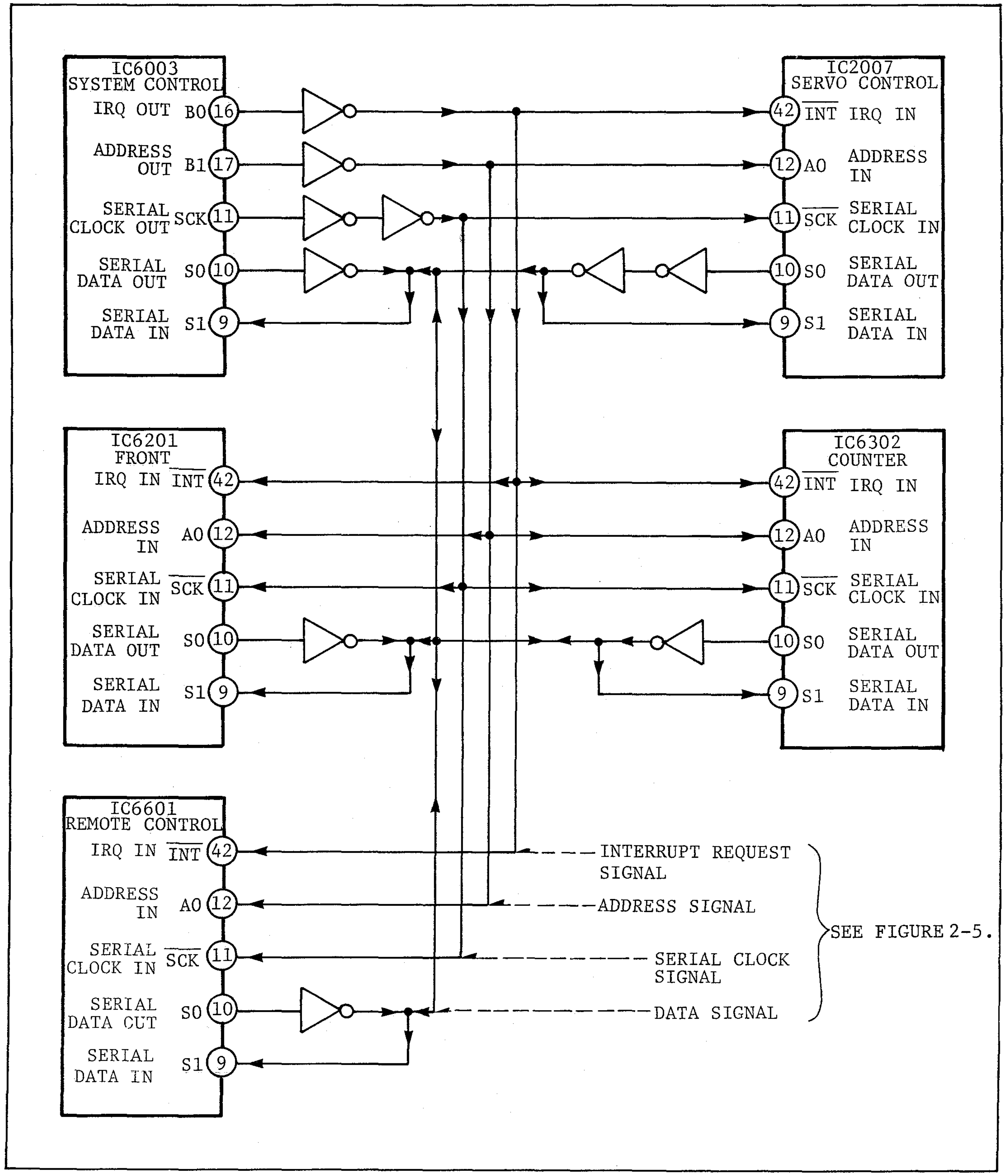

IC6003
SYSTEM CONTROL
IRQ OUT B0 16
ADDRESS OUT B1 17
SERIAL CLOCK OUT SCK 11
SERIAL DATA OUT S0 10
SERIAL DATA IN S1 9
IC2007
SERVO CONTROL
42 INT IRQ IN
12 A0 ADDRESS IN
11 SCK SERIAL CLOCK IN
10 S0 SERIAL DATA OUT
9 S1 SERIAL DATA IN
IC6201
FRONT
IRQ IN INT 42
ADDRESS IN A0 12
SERIAL CLOCK IN SCK 11
SERIAL DATA OUT S0 10
SERIAL DATA IN S1 9
IC6302
COUNTER
42 INT IRQ IN
12 A0 ADDRESS IN
11 SCK SERIAL CLOCK IN
10 S0 SERIAL DATA OUT
9 S1 SERIAL DATA IN
IC6601
REMOTE CONTROL
IRQ IN INT 42
ADDRESS IN A0 12
SERIAL CLOCK IN SCK 11
SERIAL DATA CUT S0 10
SERIAL DATA IN S1 9
INTERRUPT REQUEST SIGNAL
ADDRESS SIGNAL
SERIAL CLOCK SIGNAL
DATA SIGNAL
SEE FIGURE 2-5.

Figure 2-2. Serial Transmission Bus

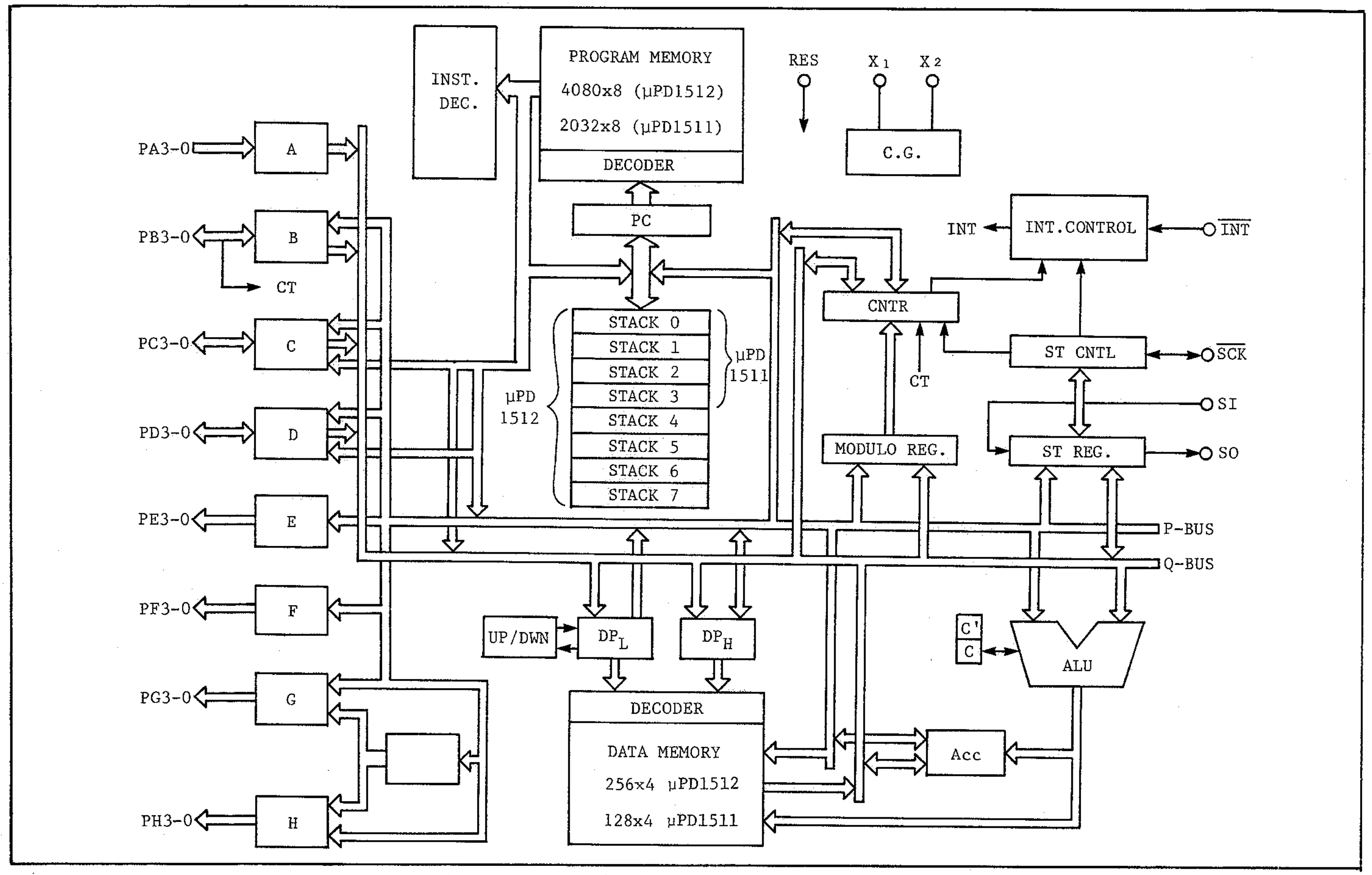
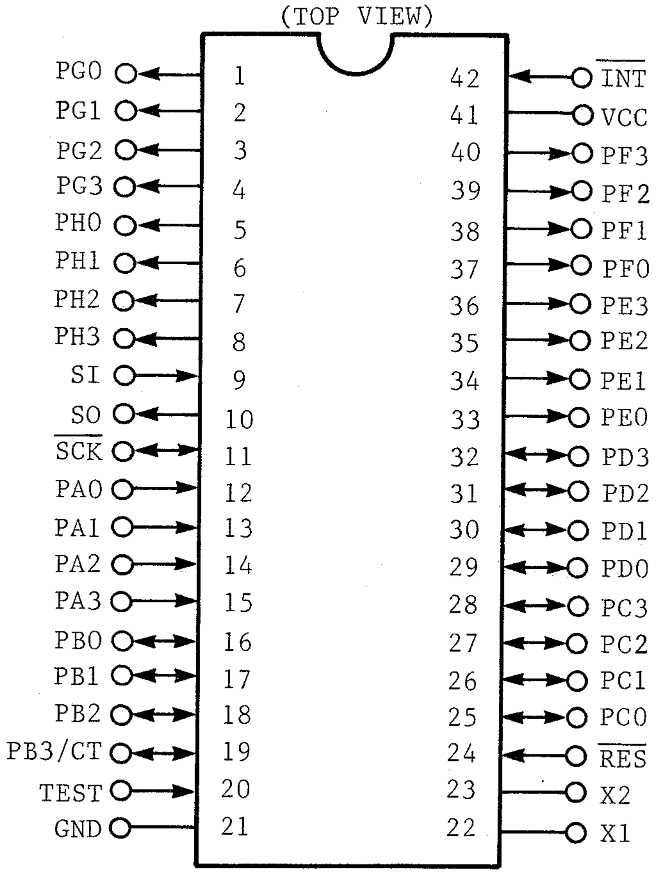

INST. DEC.
PROGRAM MEMORY
4080x8 (μPD1512)
2032x8 (μPD1511)
DECODER
RES
X1 X2
C.G.
PA3-0
A
PB3-0
B
CT
PC3-0
C
PD3-0
D
PE3-0
E
PF3-0
F
PG3-0
G
PH3-0
H
PC
STACK 0
STACK 1
STACK 2
STACK 3
STACK 4
STACK 5
STACK 6
STACK 7
μPD 1512
μPD 1511
INT
INT.CONTROL
INT
CNTR
CT
ST CNTL
SCK
SI
MODULO REG.
ST REG.
SO
P-BUS
Q-BUS
UP/DWN
DPL
DPH
C'
C
ALU
DECODER
DATA MEMORY
256x4 μPD1512
128x4 μPD1511
Acc

Figure 2-3-A. μPD1511/μPD1512 Microcomputer Block Diagram.


(TOP VIEW)
PG0 1
PG1 2
PG2 3
PG3 4
PH0 5
PH1 6
PH2 7
PH3 8
SI 9
SO 10
SCK 11
PA0 12
PA1 13
PA2 14
PA3 15
PB0 16
PB1 17
PB2 18
PB3/CT 19
TEST 20
GND 21
42 INT
41 VCC
40 PF3
39 PF2
38 PF1
37 PF0
36 PE3
35 PE2
34 PE1
33 PE0
32 PD3
31 PD2
30 PD1
29 PD0
28 PC3
27 PC2
26 PC1
25 PC0
24 RES
23 X2
22 X1

SI: SERIAL DATA INPUT
SO: SERIAL DATA OUTPUT
SCK: SERIAL CLOCK IN/OUTPUT
CT: EVENT COUNTER INPUT
INT: INTERRUPT
RES: RESET
X1,X2: CLOCK OSC
TEST: TEST
PA3-0: INPUT PORT A
PB3-0: I/O PORT B
PC3-0: I/O PORT C
PD3-0: I/O PORT D
PE3-0: OUTPUT PORT E
PF3-0: OUTPUT PORT F
PG3-0: OUTPUT PORT G
PH3-0: OUTPUT PORT H

Figure 2-3-B. Pin Assignment.

PIN NO.	NAME	I/O	Function	ACTIVE
1	PG0	OUT	E-E Mode	Ⓗ
2	PG1	OUT	REC PLAY Mode	Ⓛ
3	PG2	OUT	AUDIO DUB/E-E Mode	Ⓛ
4	PG3	OUT	AUDIO DUB PLAY/REC PLAY Mode	Ⓛ
5	PH0	OUT	SLOW Mode	Ⓛ
6	PH1	OUT	SEARCH x2 ∿ x10 Mode	Ⓛ
7	PH2	OUT	FORWARD Mode	Ⓗ
8	PH3	OUT	PLAY Mode	Ⓗ
9	SI	IN	Serial Information Signal	———
10	SO	OUT	Serial Information Signal	———
11	SCK	IN	Serial Clock Signal	———
12	PA0	IN	Dew Detected	Ⓛ
13	PA1	IN	Tape End Detected	Ⓛ
14	PA2	IN	Tape Beginning Detected	Ⓛ
15	PA3	IN	Sensor LED Opened	Ⓗ
16	PB0	OUT	Interrupt Request Signal	———
17	PB1	OUT	Address Information Signal	———
18	PB2	OUT	Serial Data Inhibit Signal	———
19	PB3	IN	Interrupt Timing Signal	2kHz
20	TEST	GND	GND	GND
21	GND	GND	GND	GND
22	X1	IN	Microcomputer Clock signal	3.58MHz
23	X2	IN		
24	RES	IN	Reset Signal	Ⓛ
25	PC0	IN	Mode Select SW Moved	See Figure 2-31
26	PC1	IN		
27	PC2	IN		
28	PC3	IN	Hall IC Signal	———
29	PD0	IN	Cassette Up SW Turned ON	Ⓛ
30	PD1	IN	Cassette Down SW Turned ON	Ⓛ
31	PD2	IN	REC Enable SW Turned ON	Ⓛ
32	PD3	IN	NTSC Model	Ⓗ
33	PE0	OUT	Front Loading Motor Rotated	DOWN Ⓗ UP Ⓛ
34	PE1	OUT		Ⓛ Ⓗ
35	PE2	OUT	Loading Motor Rotated	FOW Ⓗ REV Ⓛ
36	PE3	OUT		Ⓛ Ⓗ
37	PF0	OUT	Reel Motor Control Signal	See Figure 2-37
38	PF1	OUT		
39	PF2	OUT		
40	PF3	OUT	Sensor LED Drive Pulse	125Hz
41	VCC	IN	+5V	+5V
42	INT	IN	External Interrupt Signal	———

Figure 2-4. System Control Microcomputer I/O Table.

Serial Data Transmission System

General Description

In the multiple microcomputer system, serial data transfer is performed between each of the microcomputers.
There are four types of signal waveforms associated with the serial data (See Figure 2-5.)

1. Interrupt Signal

The Interrupt Signal is used to initiate the timing periods for serial transmissions.

2. Address Signal

The low period of the address signal is used to indicate that address information from the System Control Microcomputer to the other 4 microcomputers is being performed. The high period of the Address Signal information that data transmission is being performed.

3. Serial Clock Signal

The Clock Signal is used for the serial address/data transmission timing.

4. Data Signal

The Data Signal carries the serial address information or serial data information.

Detailed Description

The multi-microcomputer system uses the System Control software to transmit instructions from each microcomputer to the other microcomputers through the serial data line, according to each address.
Figure 2-7 is a table of Address Codes which are sequentially read by the System Control Microcomputer. The contents in locations 0(purpose of function) and 1(state of function) in this table have the fixed Address Codes 00000000 and 00000001 respectively.
The location 0 address is used together with the Data Codes in the table of Figure 2-8, and the location 1 address is used with the table of Figure 2-9. The other locations in the table of Figure 2-7 will contain various codes which will depend upon the function being activated. The Address codes are repeatedly cycled through by the System Control Microcomputer during the operation of the serial data transmission.
During the Stop mode, the System Control microcomputer repeatedly transmits the Stop function mode data to assure that the unit remains in the Stop mode.
Refer to Figures 2-6, 2-7, 2-8, and 2-9 for the example which follows.

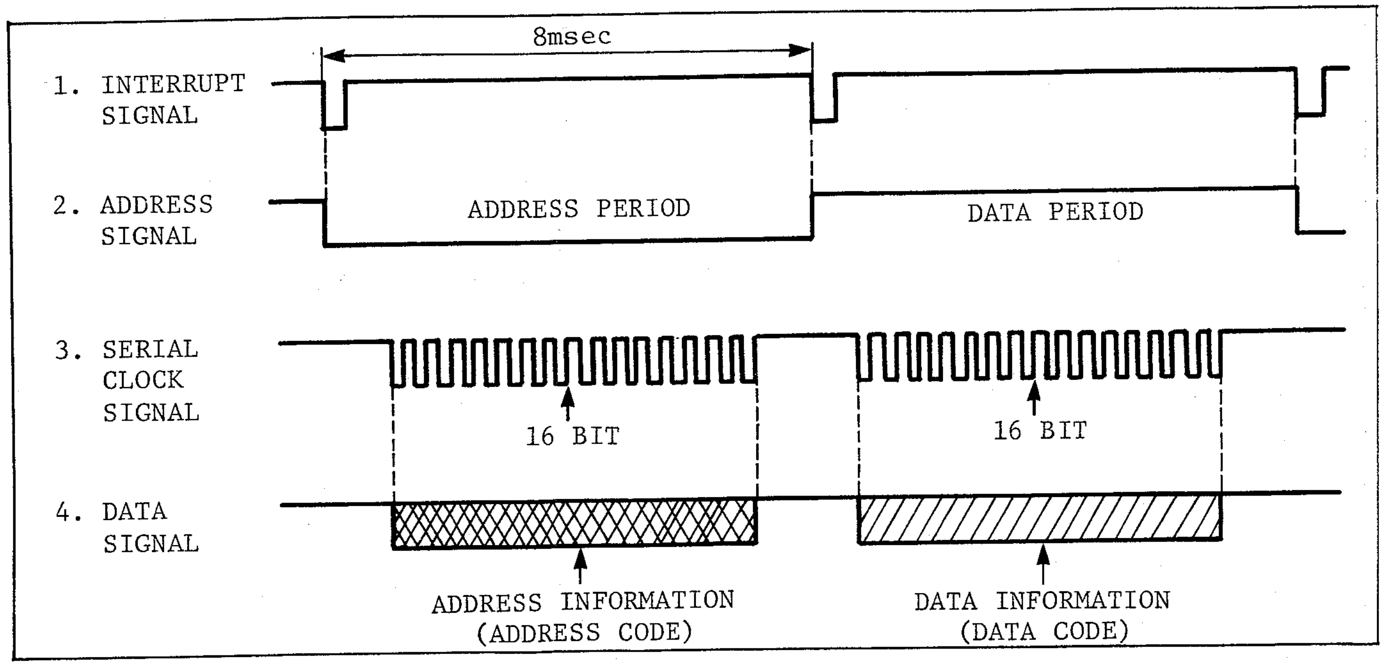
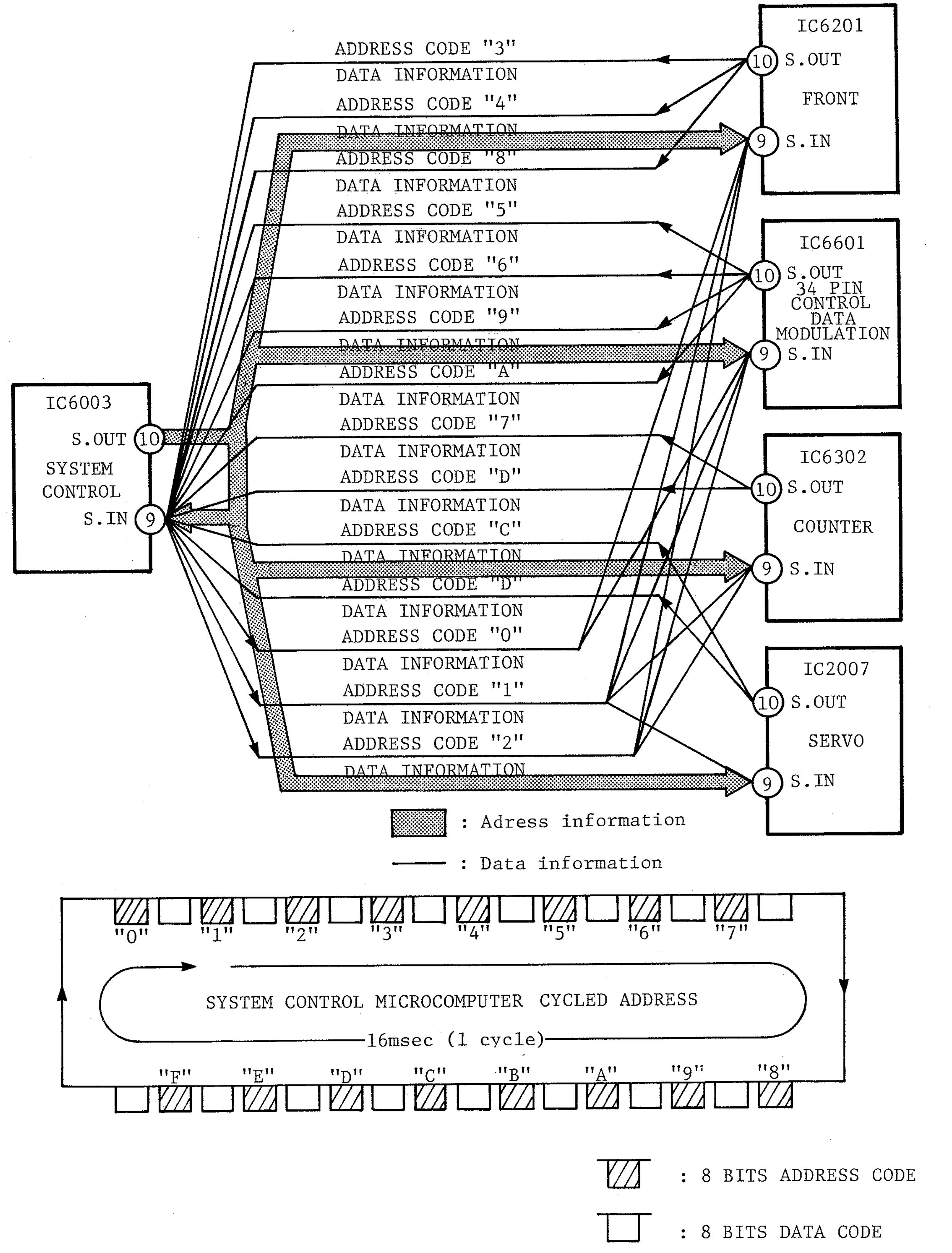

8msec
1. INTERRUPT SIGNAL
2. ADDRESS SIGNAL
ADDRESS PERIOD
DATA PERIOD
3. SERIAL CLOCK SIGNAL
16 BIT
16 BIT
4. DATA SIGNAL
ADDRESS INFORMATION (ADDRESS CODE)
DATA INFORMATION (DATA CODE)

Figure 2-5. Serial Data Transmission.


IC6201
10 S.OUT
FRONT
9 S.IN
IC6601
10 S.OUT
34 PIN CONTROL DATA MODULATION
9 S.IN
IC6302
10 S.OUT
COUNTER
9 S.IN
IC2007
10 S.OUT
SERVO
9 S.IN
IC6003
S.OUT 10
SYSTEM CONTROL
S.IN 9
ADDRESS CODE "3"
DATA INFORMATION
ADDRESS CODE "4"
DATA INFORMATION
ADDRESS CODE "8"
DATA INFORMATION
ADDRESS CODE "5"
DATA INFORMATION
ADDRESS CODE "6"
DATA INFORMATION
ADDRESS CODE "9"
DATA INFORMATION
ADDRESS CODE "A"
DATA INFORMATION
ADDRESS CODE "7"
DATA INFORMATION
ADDRESS CODE "D"
DATA INFORMATION
ADDRESS CODE "C"
DATA INFORMATION
ADDRESS CODE "D"
DATA INFORMATION
ADDRESS CODE "0"
DATA INFORMATION
ADDRESS CODE "1"
DATA INFORMATION
ADDRESS CODE "2"
DATA INFORMATION
▨ : Adress information
—— : Data information
"0" "1" "2" "3" "4" "5" "6" "7"
SYSTEM CONTROL MICROCOMPUTER CYCLED ADDRESS
16msec (1 cycle)
"F" "E" "D" "C" "B" "A" "9" "8"
▨ : 8 BITS ADDRESS CODE
☐ : 8 BITS DATA CODE

The contents of the data code can be referred in Figure 2-7.

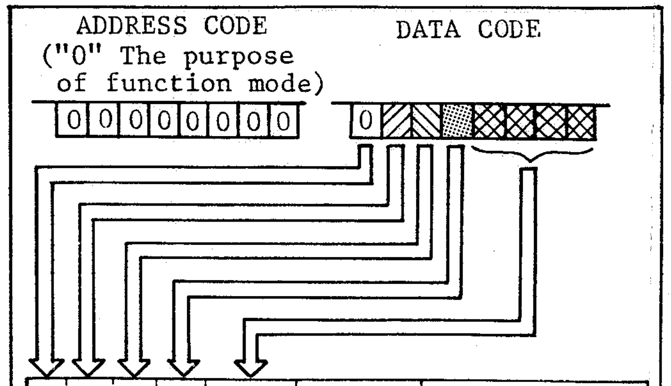
Figure 2-6. Transmission of Address and Data Information

ADDRESS CODE		CONTENT								IC REF. NO. (DATA CODE TRANSMITTER)
HEXA-DECIMAL CODE	BINARY CODE	1st Bit	2nd Bit	3rd Bit	4th Bit	5th Bit	6th Bit	7th Bit	8th Bit	
0	00000000	The purpose of function mode (See Figure 2-8.)								IC6003
1	00000001	The state of function mode (See Figure 2-9.)								IC6003
2	00000010					Auto OFF	Dew	Ending of tape	Beginning of tape	IC6003
3	00000011	Search	Pause	0	Play	Stop	FF	Rew	Eject	IC6201
4	00000100	0	0	0	0	0	0	Dubbing	Rec	IC6201
5	00000101	0	Pause	0	Play	Stop	FF	Rew	Eject	IC6601
6	00000110	Mode lock	0	0	0	0	0	Dubbing	Rec	IC6601
7	00000111	0	0	0	Play	Stop	FF	Rew	0	IC6302
8	00001000	+ Step	- Step		Search dial					IC6201
9	00001001	+ Step	- Step			Remote speed control				IC6601
A	00001010					Time Code	Camera Pause	Direct Search	Auto back Space	IC6601
B	00001011	Motor lock			The state of capstan speed					IC2007
C	00001100	Reel inhibit	Capstan inhibit							IC2007
D	00001101	Remaining tape data								IC6302
E	00001110									
F	00001110									

Figure 2-7. System Control Microcomputer Cycled Address Data Software Chart

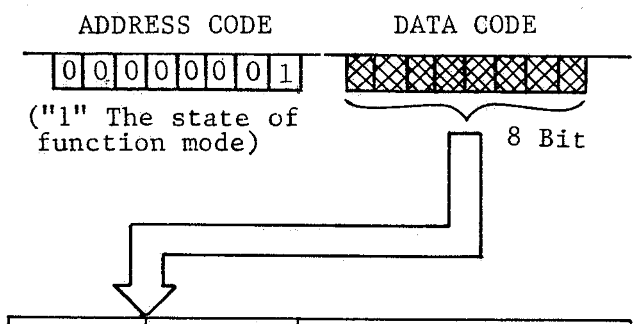
(a) When the Play button is pressed, the Front Microcomputer transmits the serial data for Play mode "00010000" to each microcomputer when the System Control has cycled to the address "00000011" ("03" in the hexadecimal notation). See Figure 2-10. Refer also to Figure 2-7, location 3. The Data code content will be 00010000, which corresponds to a "1" only in the 4th bit position marked "play" at this location.

(b) The System Control microcomputer determines whether the Play mode may be entered, or not. (For example, it detects if there is a tape in the unit, or the Auto-Off lamp remains OFF, etc.)


ADDRESS CODE
("0" The purpose of function mode)
DATA CODE
0 0 0 0 0 0 0 0
0

					HEXA-DECIMAL CODE	CONTENT
BINARY CODE						
0	0	0	0	0000	00	STOP
0	0	0	0	0001	01	EJECT
0	0	0	0	0010	02	F.F
0	0	0	0	0011	03	Short F.F
0	0	0	0	0100	04	REWIND
0	0	1	0	0101	25	REC Lamp turns on
0	1	0	0	0101	45	Audio Dubbing Lamp turns on
0	0	0	1	0001	11	PLAY
0	0	0	1	0010	12	PLAY.PAUSE
0	0	0	1	0011	13	REMOTE.SEARCH
0	0	0	1	0100	14	REMOTE SEARCH PAUSE
0	0	0	1	0101	15	LOCAL SEARCH PAUSE
0	0	0	1	0110	16	LOCAL SEARCH PAUSE
0	0	1	1	0111	37	RECORD
0	0	1	1	1000	38	RECORD PAUSE
0	0	1	1	1001	39	RECORD BACK PAUSE

Figure 2-8. The Purpose of Function Mode Software Chart.


ADDRESS CODE
DATA CODE
0 0 0 0 0 0 0 1
("1" The state of function mode)
8 Bit

BINARY CODE	HEXADECIMAL CODE	CONTENT
00000000	00	STOP
00000001	01	EJECT
00000010	02	F.F
00000011	03	Short F.F
00000100	04	REW
00100101	25	REC Lamp ON
01000101	45	Audio Dubbing Lamp ON
00000110	06	SLOW REW
00000111	07	CASSETTE IN
00001000	08	During Elevetor UP
00001001	09	Completed Elevetor DOWN
00001010	0A	Completed Loading
00001011	0B	During Sub Loading
00001100	0C	During Sub Unloading
00001101	0D	During Loading
00001110	0E	During Unloading
00001111	0F	———
00010000	10	Completed Preparation
00010001	11	PLAY
00010010	12	PLAY PAUSE
00010011	13	REMOTE SEARCH
00010100	14	REMOTE SEARCH PAUSE
00010101	15	LOCAL SEARCH
00010110	16	LOCAL SEARCH PAUSE
00110111	37	REC
00111000	38	REC PAUSE
00111001	39	REC BACK PAUSE
00111010	3A	During Record Mode
00111011	3B	REC Mode Reverse
00111100	3C	REC Mode Forward
00011101	1D	———
00011110	1E	———
00011110	1F	———

Figure 2-9. The State of Function Mode Software Chart.

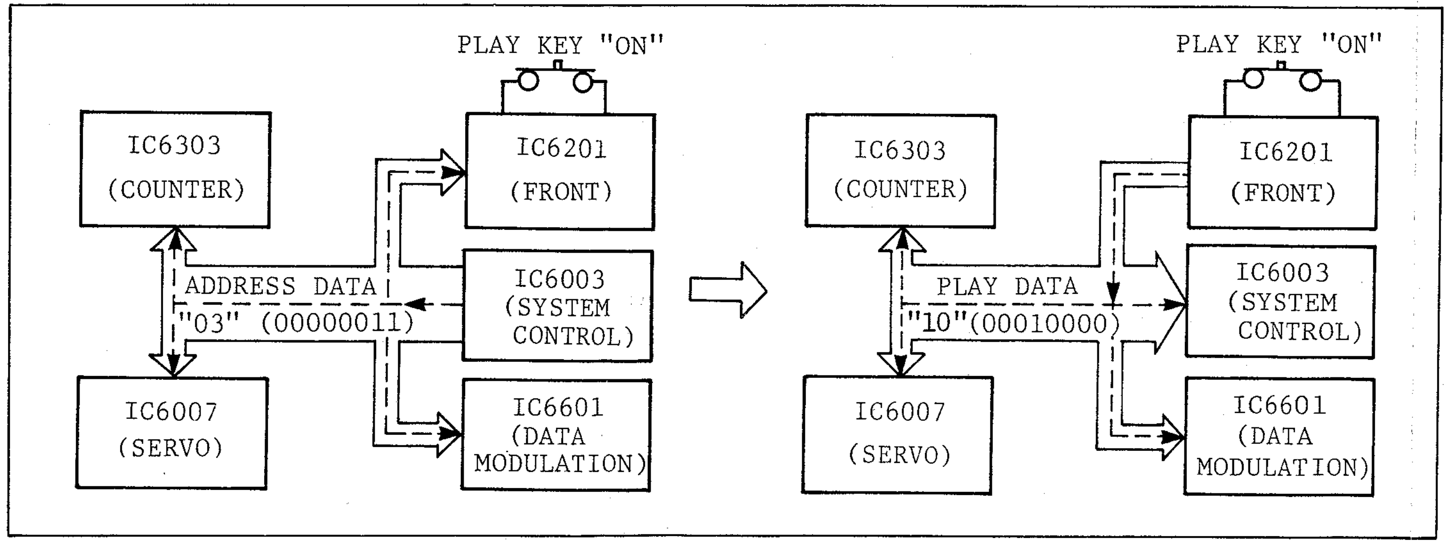

PLAY KEY "ON"
IC6303 (COUNTER)
IC6201 (FRONT)
ADDRESS DATA
"03" (00000011)
IC6003 (SYSTEM CONTROL)
IC6007 (SERVO)
IC6601 (DATA MODULATION)
PLAY KEY "ON"
IC6303 (COUNTER)
IC6201 (FRONT)
PLAY DATA
"10"(00010000)
IC6003 (SYSTEM CONTROL)
IC6007 (SERVO)
IC6601 (DATA MODULATION)

Figure 2-10. Play Data and Address Data.

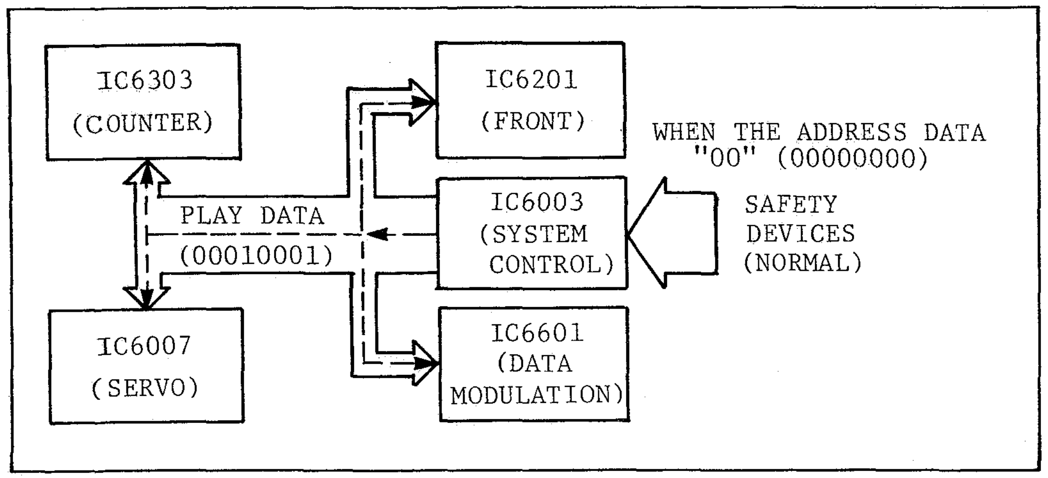

IC6303
(COUNTER)
IC6201
(FRONT)
WHEN THE ADDRESS DATA "00" (00000000)
PLAY DATA
(00010001)
IC6003
(SYSTEM CONTROL)
SAFETY DEVICES (NORMAL)
IC6007
(SERVO)
IC6601
(DATA MODULATION)

Figure 2-11. Play Data.

(c) After the System Control microcomputer has determined that the unit may activate the Play mode, it transmits the Play data ("00010001") as the purpose of function mode when the address data has cycled to the location "00000000" in the binary notation or "00" in the hexadecimal notation (Refer to Figure 2-7). Thus, the other microcomputers recognize that the purpose is the Play mode. See Figure 2-11.

(d) When the address data is "00000001" ("01") which indicates that the state of the function is being transmitted, the System Control microcomputer transmits to each microcomputer the data the unit is now loading the tape (data code "00001101" or "0D"-Figure 2-9). See Figure 2-13.

(e) After receiving this data, the Servo microcomputer rotates the cylinder motor, and provides a tension for the loading.

(f) The System Control microcomputer continues to transmit the Play mode function data until the loading is completed.

(g) When loading is completed, the system control microcomputer transmits the data code "loading completed" ("00001010"-0A in Figure 2-9), to each microcomputer when the address data has again cycled to "00000001" ("01"). See Figure 2-13.

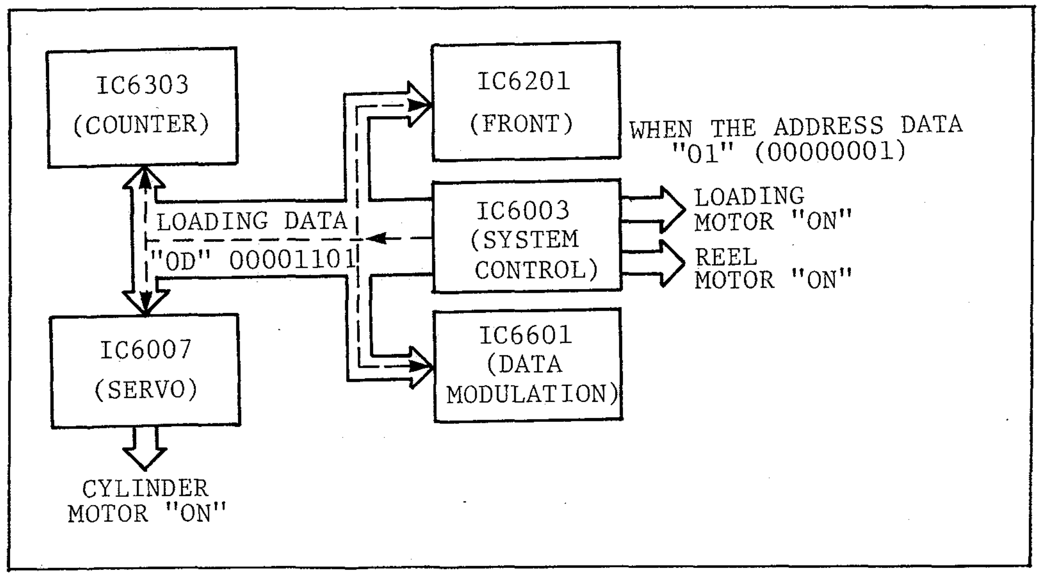

IC6303
(COUNTER)
IC6201
(FRONT)
WHEN THE ADDRESS DATA "01" (00000001)
LOADING DATA
"0D" 00001101
IC6003
(SYSTEM CONTROL)
LOADING MOTOR "ON"
REEL MOTOR "ON"
IC6007
(SERVO)
IC6601
(DATA MODULATION)
CYLINDER MOTOR "ON"

Figure 2-12. Loading Data.

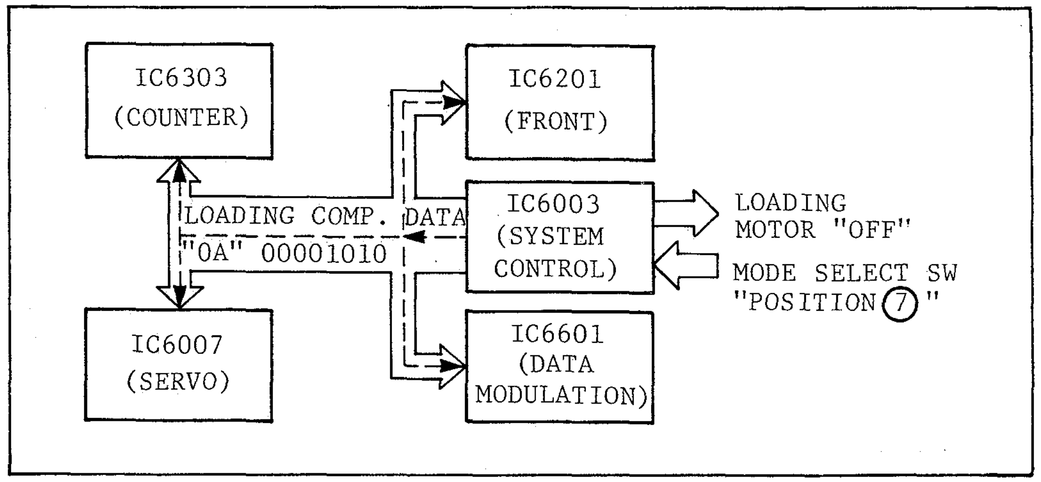

IC6303
(COUNTER)
IC6201
(FRONT)
LOADING COMP. DATA
"0A" 00001010
IC6003
(SYSTEM CONTROL)
LOADING MOTOR "OFF"
MODE SELECT SW "POSITION⑦"
IC6007
(SERVO)
IC6601
(DATA MODULATION)

Figure 2-13. Loading Completion Data.

(h) The E/E mode + Forward X1 tape-run instruction "00010000" ("10") is sent out during the address data "00000001" ("01").

(i) When this instruction is received, the Servo microcomputer rotates the capstan motor in the Forward X1 mode.

(j) Then, the System Control microcomputer and the Servo microcomputer send out the E/E mode + Forward X1 tape-run instruction for about a second, and then transmit to each microcomputer the information that the unit has entered the Play mode when the address data is at "00000001" ("01").
After the exchange of the serial data and the serial addresses described above, the unit enters the Play mode. See Figure 2-14 Play Software Cycle.

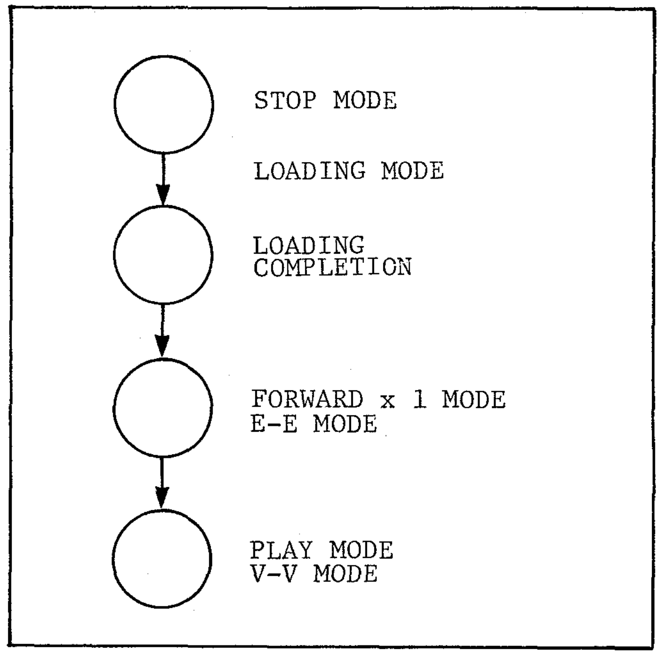

STOP MODE
LOADING MODE
LOADING COMPLETION
FORWARD x 1 MODE
E-E MODE
PLAY MODE
V-V MODE

Figure 2-14. Play Software Cycle.

1. System Control Microcomputer Circuit

General Description

The system control microcomputer circuit provides for the sensing of inputs from the Supply/Takeup photo transistors, interrupt circuit, elevator up, down switches, Dew sensor, and detection of photo LED failure sensors, Loading motor drive, elevator motor drive, and photo sensor signals.

Detailed Description

1-1. MICROCOMPUTER CLOCK CIRCUIT

The microcomputer clock is internally generated using the components X1 and C24, C25 at pins 22 and 23 (See Figure 2-15.)
The crystal frequency of 3.58MHz is counted down to about 223kHz, which is the serial clock signal used for the microcomputer programming.
See Figure 2-16.

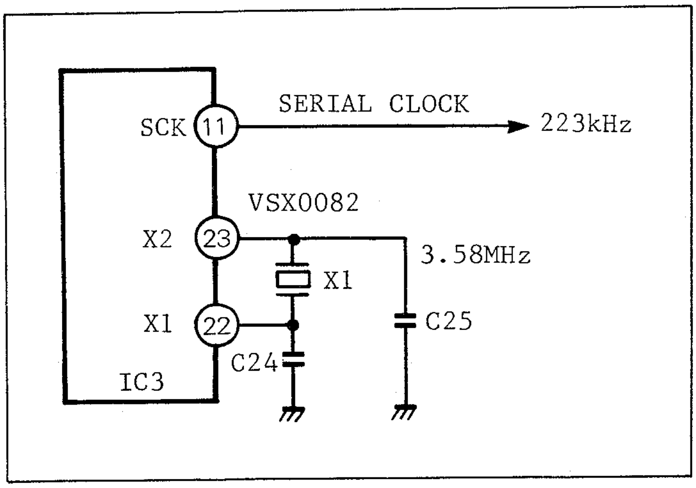

SCK
11
SERIAL CLOCK
223kHz
VSX0082
X2
23
3.58MHz
X1
X1
22
C25
C24
IC3

Figure 2-15. Microcomputer Clock Circuit.

1-2. INTERRUPT CIRCUIT

The Interrupt Circuit signal is produced by an oscillator operating at approximately 320kHz using IC1, X2 R9, R7, C1 and C2 and the R-C networks shown in Figure 2-16.

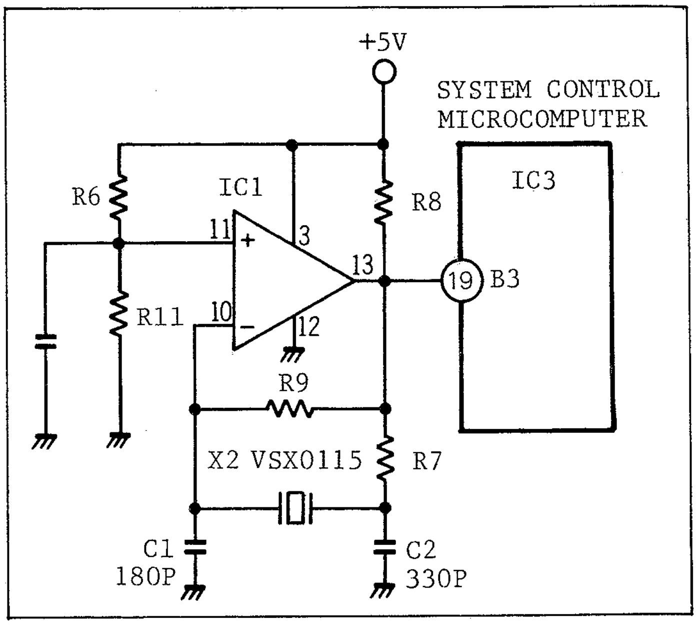

+5V
SYSTEM CONTROL
MICROCOMPUTER
IC3
IC1
R6
R8
11
+
3
13
19
B3
R11
10
-
12
R9
X2 VSX0115
R7
C1
180P
C2
330P

Figure 2-16. Interrupt Circuit.

The output pulse is sent to the System Control Microcomputer IC3 pin 19 where it is counted down to about 2kHz as shown in Figure 2-16. The counted down pulse signal is used for serial address/data timing. (Refer also to Figure 2-5.)

1-3. POWER RESET CIRCUIT

At power turns on and whenever the power supply voltage falls below 3.5 volts, the microcomputer must be reset. Transistor Q8 and zener diode D17 form a voltage comparator which generates the reset as shown in Figure 2-17.

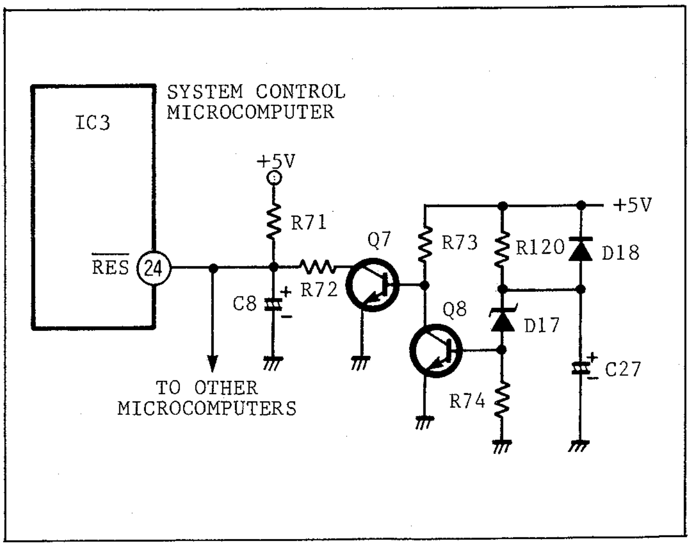

IC3
SYSTEM CONTROL
MICROCOMPUTER
+5V
R71
Q7
R73
R120
D18
+5V
RES
24
R72
C8
Q8
D17
C27
R74
TO OTHER
MICROCOMPUTERS

Figure 2-17. Reset Circuit.

1-4. SAFETY DEVICES

A safety device block diagram is shown in Figure 2-18.

(a) Dew Sensor

If moisture or condensation occurs inside the unit, the unit will stop and all further operations will be inhibited until the moisture has evaporated. The dew sensor itself is a special variable resistor which changes its resistance in response to changes in the ambient humidity.
The sensor ranges in resistance from about 5KΩ at 90% humidity to about 50kΩ at 98% humidity. Refer to Figure 2-19. IC1 pin 14 is usually High, but the presence of moisture causes the voltage at IC1 pin 8 to rise.
This causes the output of IC1 pin 14 to go Low. The Low signal goes to the System Control Microcomputer IC3 pin 12 which transmits the serial data to the Front Microcomputer to illuminate the Auto-OFF lamp.

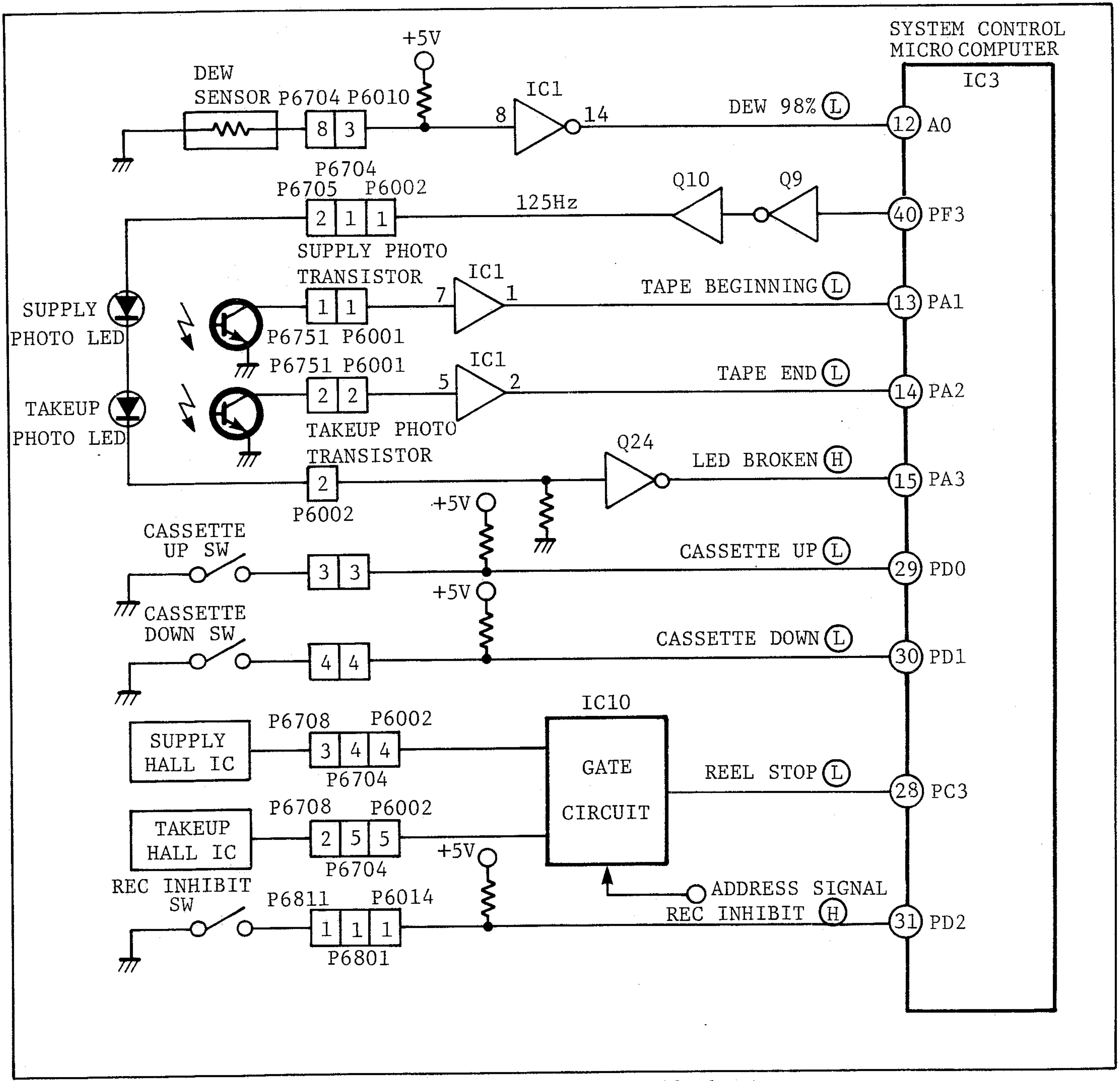

+5V
DEW SENSOR
P6704
P6010
IC1
8
14
DEW 98% Ⓛ
SYSTEM CONTROL MICRO COMPUTER
IC3
12 A0
P6704
P6705
P6002
125Hz
Q10
Q9
40 PF3
SUPPLY PHOTO TRANSISTOR
IC1
7
1
TAPE BEGINNING Ⓛ
13 PA1
SUPPLY PHOTO LED
P6751 P6001
P6751 P6001
IC1
5
2
TAPE END Ⓛ
14 PA2
TAKEUP PHOTO LED
TAKEUP PHOTO TRANSISTOR
Q24
LED BROKEN Ⓗ
15 PA3
P6002
+5V
CASSETTE UP SW
CASSETTE UP Ⓛ
29 PD0
+5V
CASSETTE DOWN SW
CASSETTE DOWN Ⓛ
30 PD1
IC10
SUPPLY HALL IC
P6708
P6002
P6704
GATE CIRCUIT
REEL STOP Ⓛ
28 PC3
TAKEUP HALL IC
P6708
P6002
P6704
+5V
ADDRESS SIGNAL
REC INHIBIT SW
P6811
P6014
P6801
REC INHIBIT Ⓗ
31 PD2

Figure 2-18. Safety Device Block Diagram

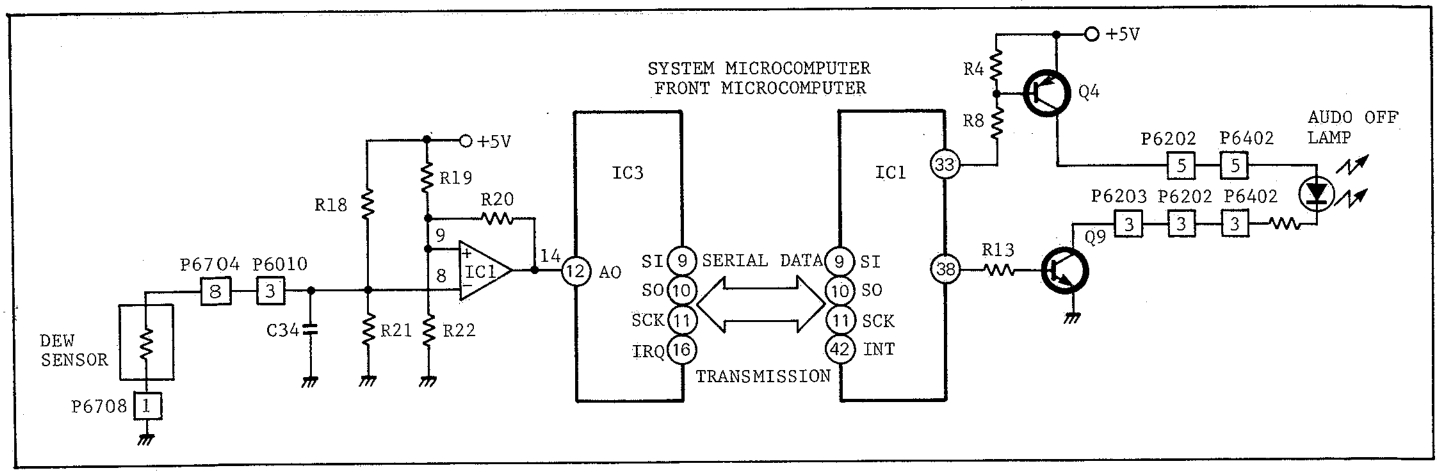

SYSTEM MICROCOMPUTER
FRONT MICROCOMPUTER
+5V
R4
Q4
R8
AUDO OFF
LAMP
P6202
P6402
P6203 P6202 P6402
5
3
Q9
R13
IC3
IC1
33
38
+5V
R19
R20
R18
9
8
IC1
14
12
AO
SI
SO
SCK
IRQ
SERIAL DATA
TRANSMISSION
SI
SO
SCK
INT
9
10
11
16
42
P6704 P6010
8
3
C34
R21
R22
DEW
SENSOR
P6708
1

Figure 2-19. DEW Sensor Circuit.

(b) Tape Detection Photo Sensor Circuit

To detect the translucent leader at the end of the tape for tape protection, photo transistors and infrared light emitting diodes (LED) are used. This infrared LED has a current limitation so it is pulsed by the 320kHz interrupt oscillator counted down to 125Hz by the System Control Microcomputer.
Figure 2-20. shows the 1:7 duty cycle waveform which is applied to the Photo LED.
Refer to Figure 2-21. The 125Hz pulse signal is supplied from IC3 pin 40 to the buffer transistor Q9 base. Transistor Q10 is used as a switch. The Photo Sensor LED Current goes through Q10, the LED, and R17 to ground. When the power is ON, +20 volts supplied from connector P6004 pin 1. The diode D14 is added to prevent overcurrent, and Capacitors, C17, C18 are added to reduce noise in the DC Voltage line.
When there is no tape in the unit or when the translucent leader is present, the phototransistor is exposed to the sensor LED, and the phototransistor turns on. As can be seen Figure 2-21, two stages of IC1 form independent comparators and the outputs of these comparators are supplied to the System Control Microcomputer. When the end of the tape is sensed, the separate sensors send a Low to pins 13 or 14 of IC1.
The Microcomputer then uses this information to first generate a stop and then an Auto Wind Command.

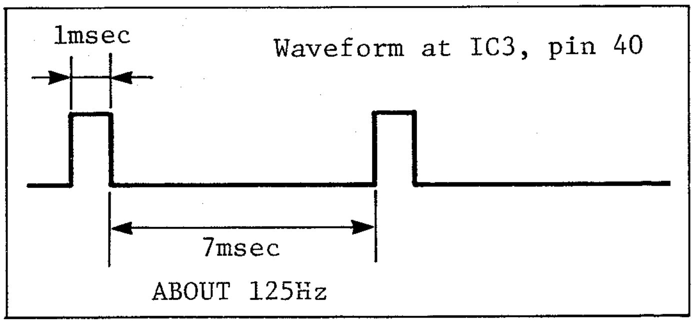


Figure 2-20. Photo LED Oscillator Waveform.

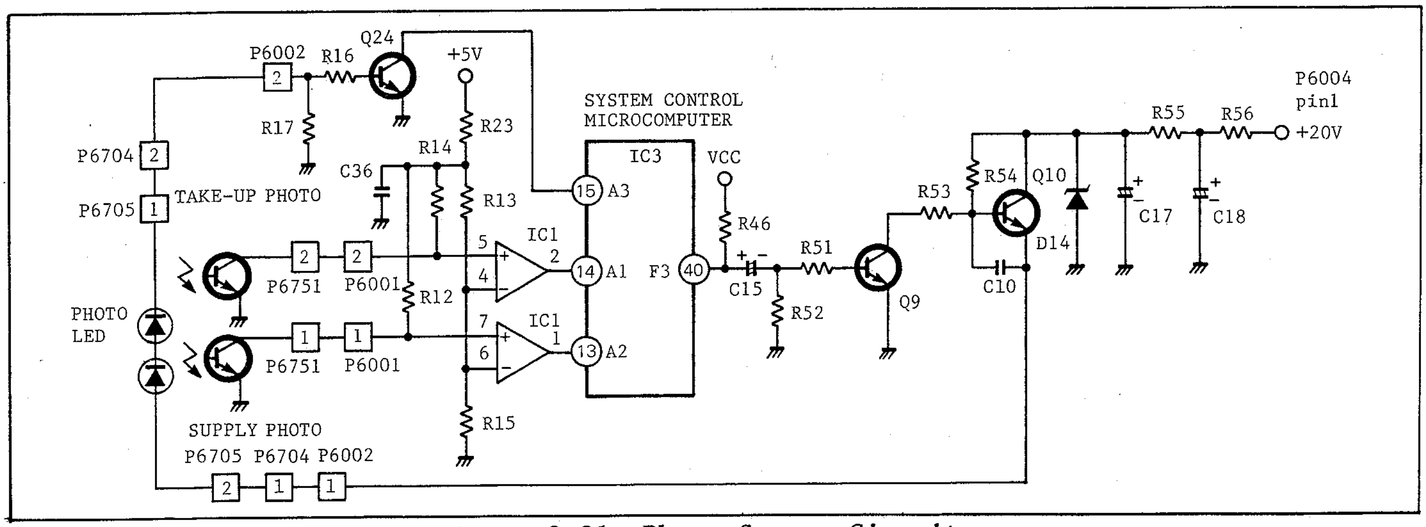

P6002
R16
Q24
+5V
R17
R23
P6704
2
P6705
1
TAKE-UP PHOTO
C36
R14
R13
SYSTEM CONTROL
MICROCOMPUTER
IC3
VCC
15
A3
IC1
5
4
2
14
A1
F3
40
R46
C15
R51
R52
Q9
R53
R54
Q10
D14
C10
P6751
P6001
R12
7
6
IC1
1
13
A2
PHOTO
LED
R15
SUPPLY PHOTO
P6705 P6704 P6002
R55
R56
P6004
pin1
+20V
C17
C18

Figure 2-21. Photo Sensor Circuit.

(c) Reel Lock Detection Circuit

The Reel Lock Detection circuit ensures that loading takes place and that once loaded, the tape is taken up by either the Takeup Reel or the Supply Reel, depending upon the direction of tape travel. The Supply and Takeup Reels each have a 16-pole magnet positioned in close proximity to a Hall Effect IC which is located underneath the reel table as shown in Figure 2-22.

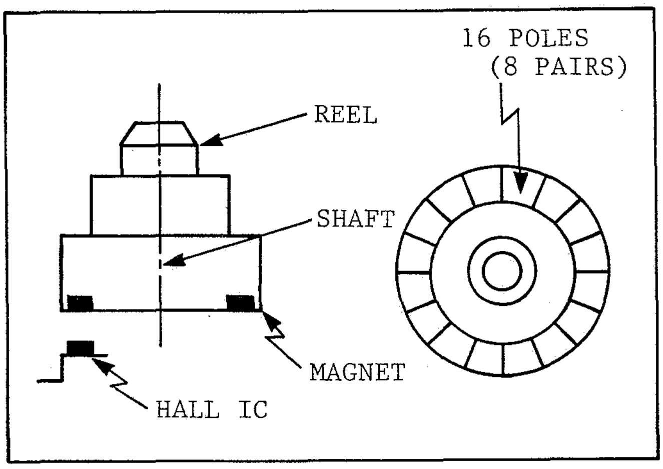

16 POLES
(8 PAIRS)
REEL
SHAFT
MAGNET
HALL IC

Figure 2-22. Reel Table View.

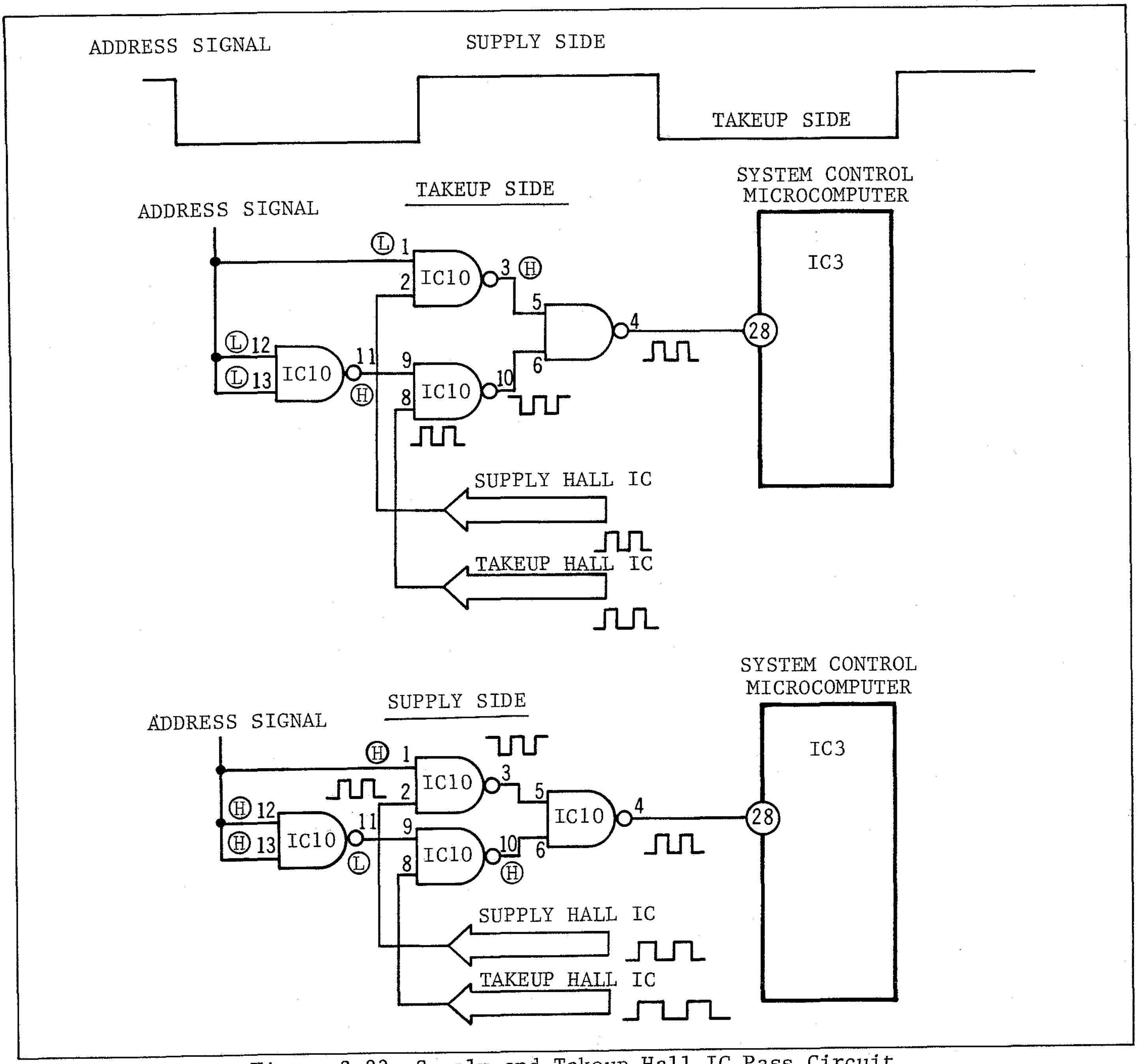

ADDRESS SIGNAL
SUPPLY SIDE
TAKEUP SIDE
ADDRESS SIGNAL
TAKEUP SIDE
SYSTEM CONTROL
MICROCOMPUTER
IC3
Ⓛ 1
2
IC10
3 Ⓗ
5
4
28
Ⓛ 12
Ⓛ 13
IC10
11
Ⓗ
9
8
IC10
10
6
SUPPLY HALL IC
TAKEUP HALL IC
SYSTEM CONTROL
MICROCOMPUTER
SUPPLY SIDE
ADDRESS SIGNAL
IC3
Ⓗ 1
2
IC10
3
5
IC10
4
28
Ⓗ 12
Ⓗ 13
IC10
11
Ⓛ
9
8
IC10
10
Ⓗ
6
SUPPLY HALL IC
TAKEUP HALL IC

Figure 2-23. Supply and Takeup Hall IC Pass Circuit.

As the reel spins, the Hall IC shifts the voltage which develops across the load resistor of the Hall IC according to the changes in the magnetic field. Reel rotation, therefore, generates a square-wave output.
While the High signal is being applied to IC10 pins 1, 12, 13 from IC2 pin 12, the Address Data line, the pulse from the Supply HALL IC is sent to IC3 pin 28 through a NAND circuit.
While the Low signal is applied to IC10 pins 1, 12, 13 from IC2 pin 12, the Address Data line, the pulse from the Takeup HALL IC is sent to IC3 pin 28 through a NAND Circuit.

(d) Recording Inhibit Switch

This Prevents the accidental erasure when the pre-recorded tape is playing back.
When the cassette safety tab is broken off, IC3 pin 31 goes high, it can not erase as shown in Figure 2-24.

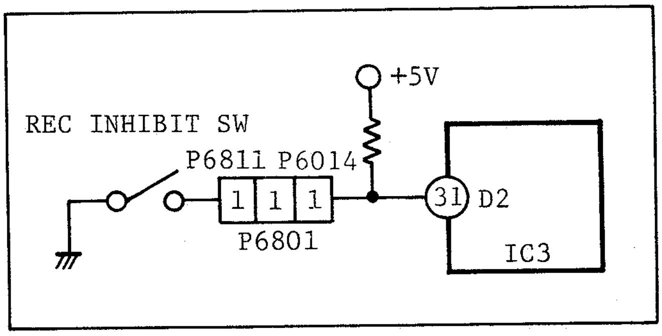
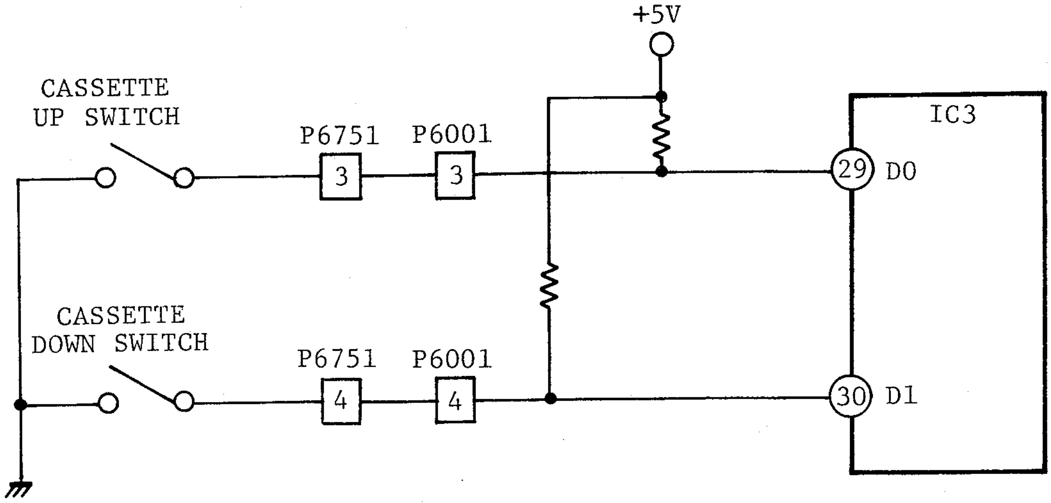


Figure 2-24. Recording Inhibit Switch

(e) Cassette Tape UP/DOWN Detector

The Cassette Tape UP/DOWN Detector switches are located as shown in Figure 2-19, and the operation of the switches is given in the chart of Figure 2-25.
The signals from the cassette IN/UP/DOWN switches are applied to pin 29 and pin 30 of the IC3 microcomputer as shown in the circuit of Figure 2-25.
If the cassette tape is not inserted into the cassette compartment, or if the cassette compartment is not completely lowered within 8 seconds, all operations are inhibited. The unit will stay in or go into eject position to prevent tape damage.



CONDITION / SWITCH	NO CASSETTE AND UP	CASSETTE INSERTED	CASSETTE INSERTED AND DOWN
UP SW	L	H	H
DOWN SW	H	H	L

Figure 2-25. Cassette UP/DOWN Detector Circuit.

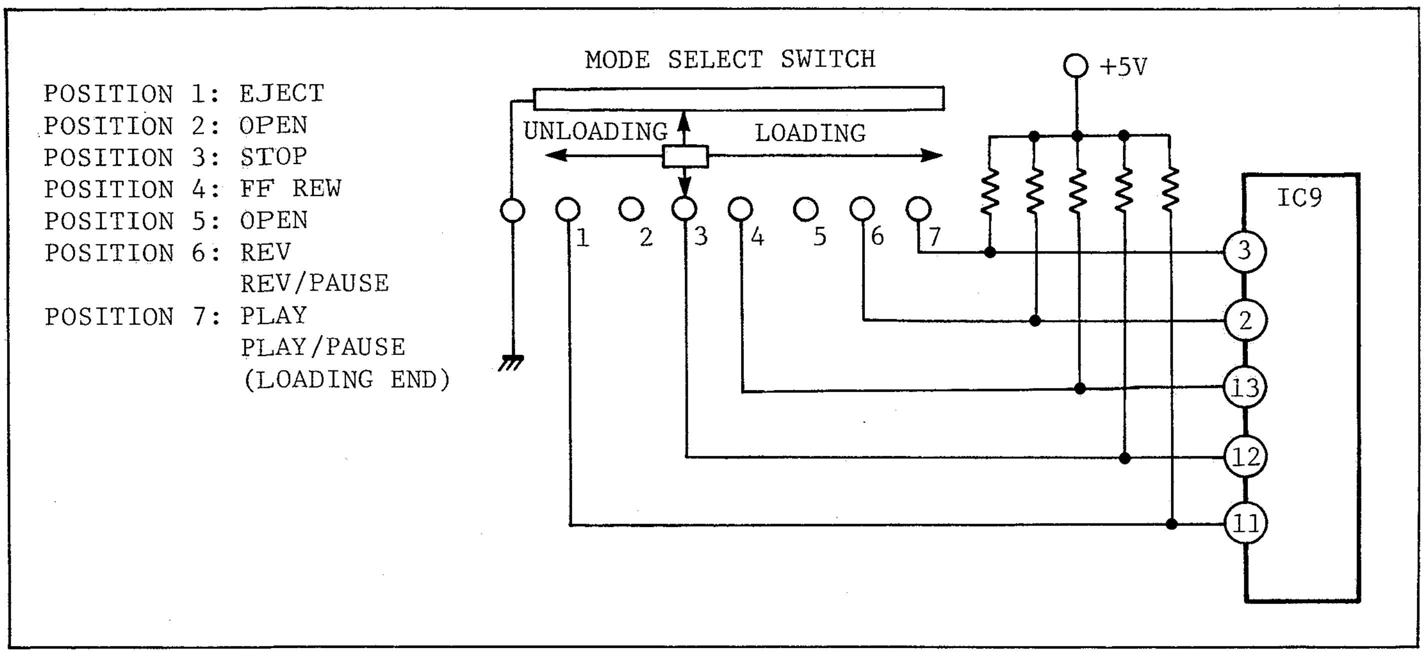

POSITION 1: EJECT
POSITION 2: OPEN
POSITION 3: STOP
POSITION 4: FF REW
POSITION 5: OPEN
POSITION 6: REV
REV/PAUSE
POSITION 7: PLAY
PLAY/PAUSE
(LOADING END)
MODE SELECT SWITCH
UNLOADING
LOADING
+5V
1
2
3
4
5
6
7
IC9
3
2
13
12
11

Figure 2-26. Mode Select Switch.

1-5. MODE SELECT SWITCH

The mechanical movement is driven by the mode select switch which is related to the loading motor directions (loading and unloading).
The position of the mode select switch indicates the mode, PLAY, REVERSE, PAUSE, FF/REW, STOP and EJECT, and the information is sent to the microprocessor in the system control section which memorizes the position.
(See Figure 2-26).

1-6. CASSETTE IN/UP/DOWN DETECTOR AND FRONT LOADING MOTOR DRIVE

When the cassette is inserted, the front loading mechanism automatically lowers the cassette compartment using the front loading motor. This is followed by a subloading operation performed by the loading motor which places the tape in contact with the A/C head. Figure 2-27 gives the sequence for the loading operation in flow chart form.
When the Cassette In and the Cassette Up switches have detected the cassette, IC3 pin 29 goes high. The microcomputer IC3 then generates a Low signal at pin 34, and together with the normal High at pin 33 drives the Front-Loading Motor through IC4 as shown in Figure 2-29.

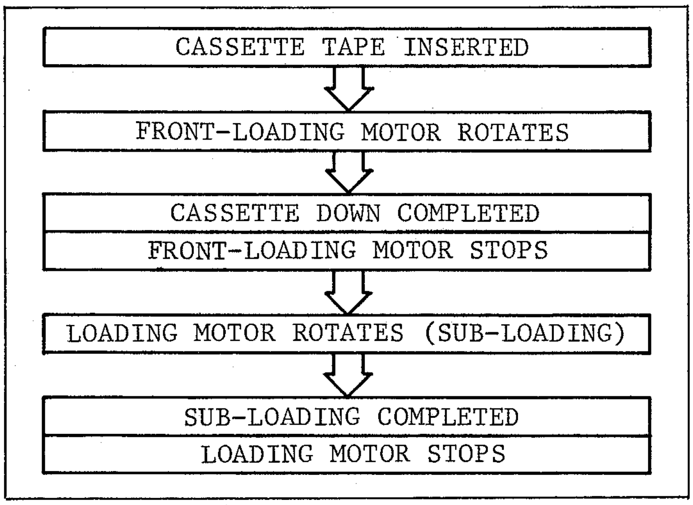

CASSETTE TAPE INSERTED
FRONT-LOADING MOTOR ROTATES
CASSETTE DOWN COMPLETED
FRONT-LOADING MOTOR STOPS
LOADING MOTOR ROTATES (SUB-LOADING)
SUB-LOADING COMPLETED
LOADING MOTOR STOPS

Figure 2-27. Flow Chart of Front Loading.

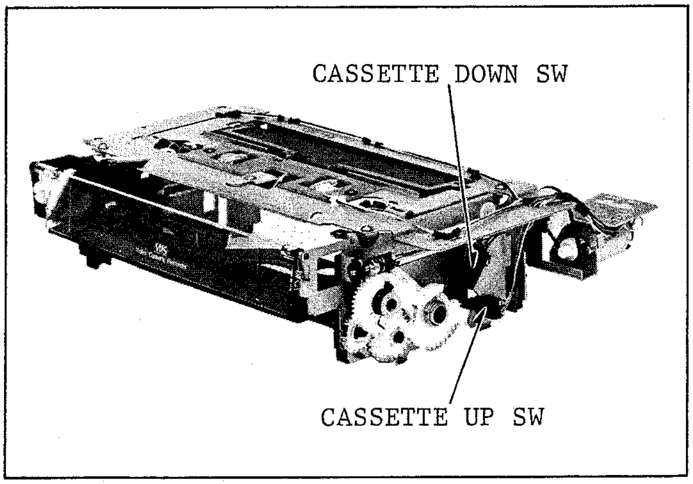
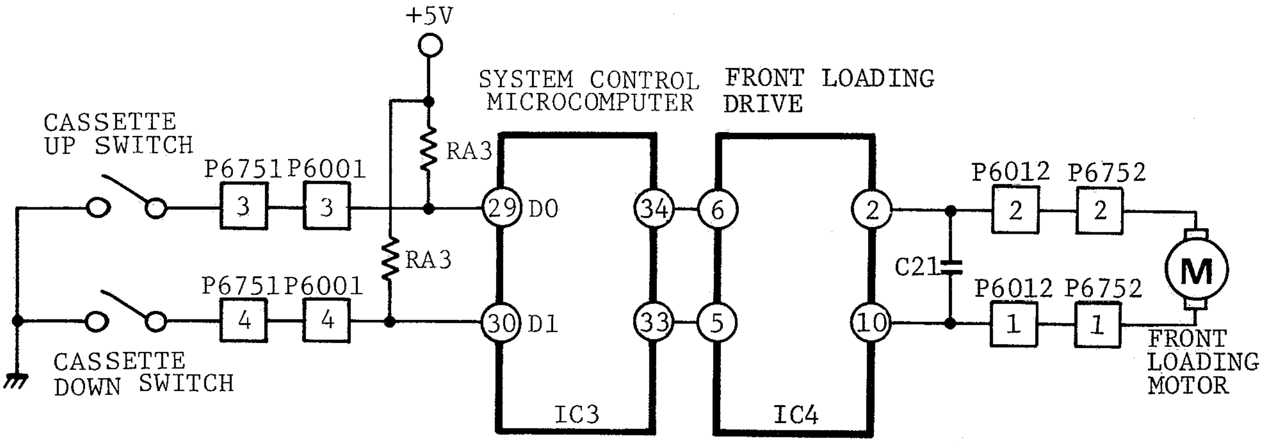

CASSETTE DOWN SW
CASSETTE UP SW

Figure 2-28. Front Loading Mechanism.

As soon as the cassette has been lowered, the Front-Loading Motor must be stopped.

When the cassette compartment is down the Cassette-Down switch closes and IC3 pin 30 goes Low, pin 34 goes back to High, and the Front-Loading Motor stops.


+5V
SYSTEM CONTROL MICROCOMPUTER
FRONT LOADING DRIVE
CASSETTE UP SWITCH
P6751
P6001
3
3
RA3
29 D0
34
6
2
P6012
P6752
2
2
RA3
P6751
P6001
4
4
30 D1
33
5
10
C21
P6012
P6752
1
1
M
FRONT LOADING MOTOR
CASSETTE DOWN SWITCH
IC3
IC4

CONDITION / SWITCH	NO CASSETTE AND UP	CASSETTE INSERTED	CASSETTE INSERTED AND DOWN
UP SW	L	H	H
DOWN SW	H	H	L

H: OPEN L: CLOSE

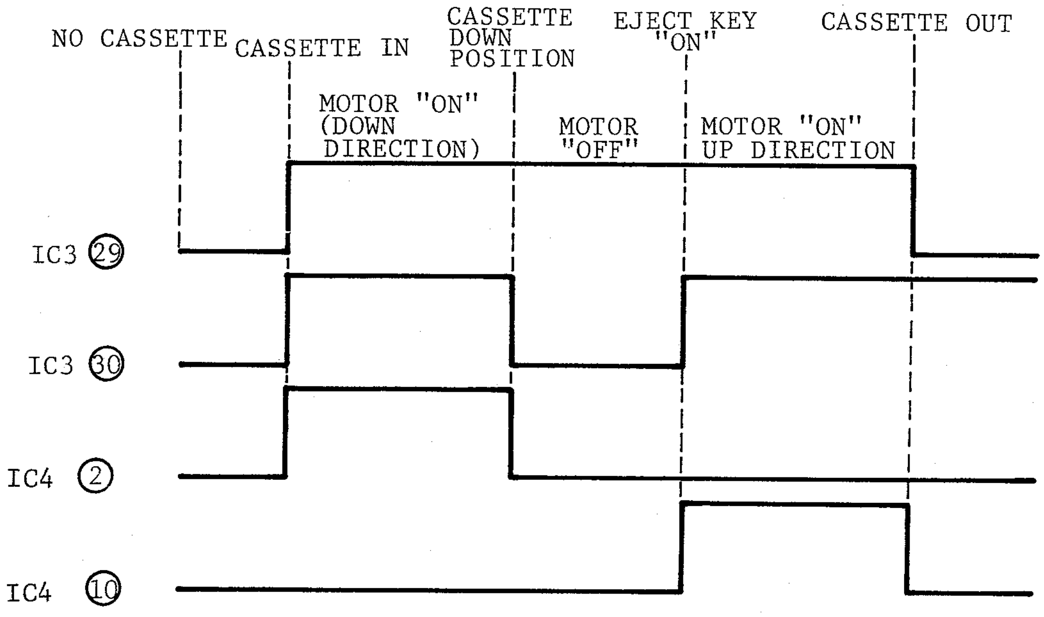
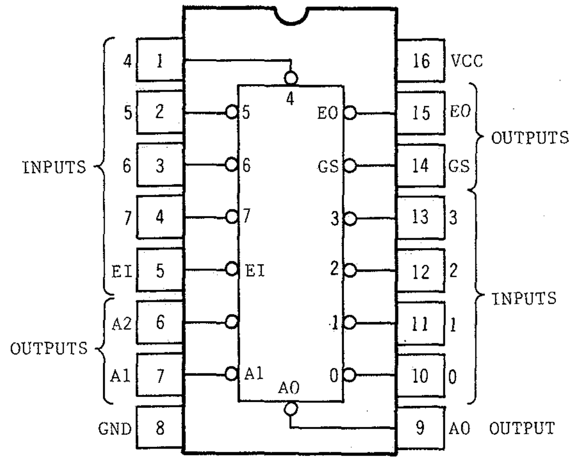

NO CASSETTE
CASSETTE IN
CASSETTE DOWN POSITION
EJECT KEY "ON"
CASSETTE OUT
MOTOR "ON" (DOWN DIRECTION)
MOTOR "OFF"
MOTOR "ON" UP DIRECTION
IC3 ㉙
IC3 ㉚
IC4 ②
IC4 ⑩

Figure 2-29. Cassette UP/DOWN Detector Circuit and Front Loading Motor Circuit.

1-7. LOADING MOTOR DRIVE

When the cassette is lowered, the microcomputer IC3 pin 30 becomes Low. The microcomputer IC3 then generates a high signal at pin 35 and Low signal at pin 36, which drives the Loading Motor through IC5 as shown in Figure 2-30.
When the subloading is completed, the loading motor must be stopped. Refer to Figure 2-29. As soon as subloading is completed, the Mode Select Switch position 3 closes and applies a Low to IC9 pin 12. ("8-line to 3-line" Octal Priority Encoder).
The output of the Binary code signal (101) from IC9 pins 6, 7 and 9 are sent to microcomputer IC3 pins 27, 26, and 25 as shown in Figure 2-30 and 2-31.
Then microcomputer IC3 generates a low signal at pin 35 which stops the loading motor.
When the subloading is completed and the PLAY key is pressed, the microcomputer IC3 then generates a high signal at pin 35 and low signal at pin 36, which drives the loading motor through IC5 same as subloading function.
When loading is completed, the loading motor must be stopped. This is done by detecting the position 3 to position 7 as shown in Figure 2-32.
A low signal is then applied to IC9 pin 3. The output of the Binary code signal (100) from IC9 pins 6, 7 and 9 are sent to microcomputer IC3 pins 27, 26 and 27.



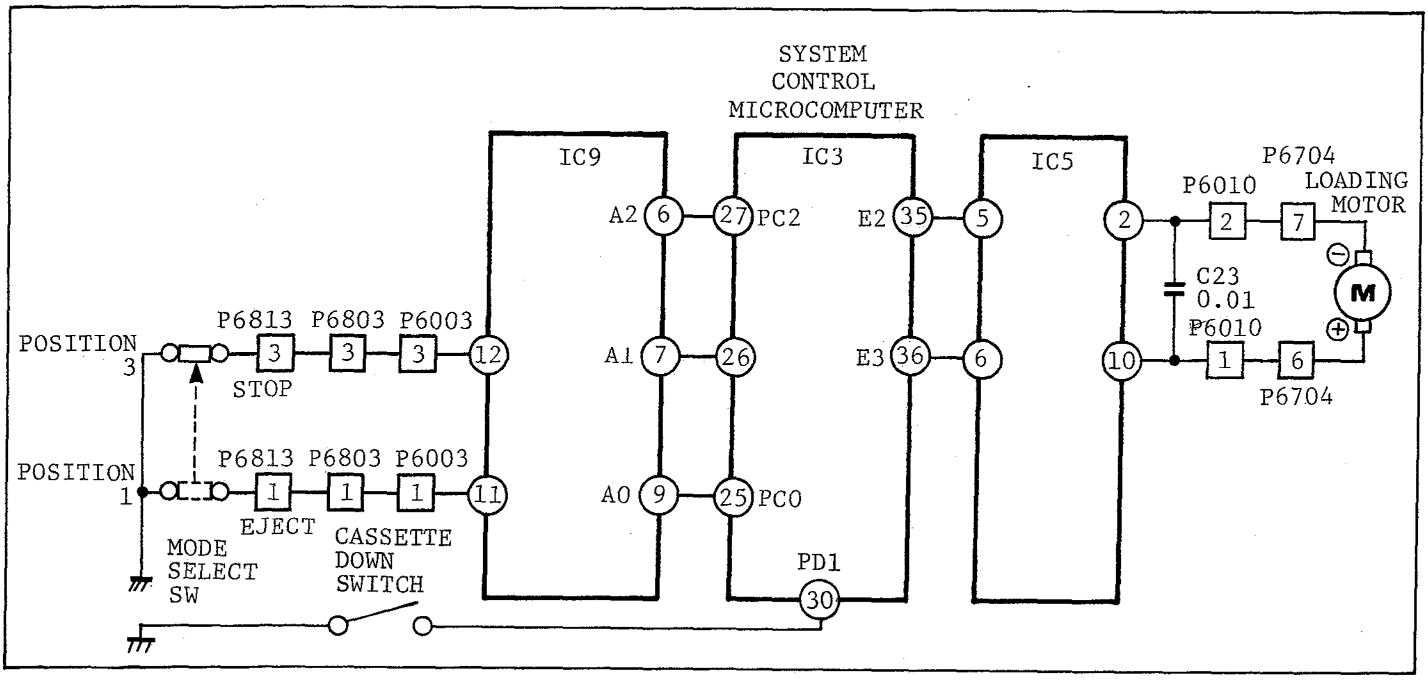
INPUTS
OUTPUTS
4
5
6
7
EI
A2
A1
GND
1
2
3
4
5
6
7
8
16
15
14
13
12
11
10
9
VCC
EO
GS
3
2
1
0
A0
OUTPUTS
INPUTS
OUTPUT

Top View

Pin Assiment

PIN NO. (IC9) / MODE S.SW POSITION / MODE		INPUT					OUTPUT		
		⑪	⑫	⑬	②	③	⑨	⑦	⑥
EJECT	1	L	H	H	H	H	L	H	H
STOP(SUBLOADED)	3	H	L	H	H	H	H	L	H
FF/REW	4	H	H	L	H	H	L	L	H
REV	6	H	H	H	L	H	L	H	L
PLAY	7	H	H	H	H	L	H	L	L
BETWEEN EACH MODE AND PIN		H	H	H	H	H	H	H	H

Figure 2-31. Pin Assignment & Function Chart of 8 line to 3 line Octal Priority Encoder (74LS148).



SYSTEM CONTROL MICROCOMPUTER
IC9
IC3
IC5
A2
6
27
PC2
E2
35
5
2
P6704
P6010
LOADING MOTOR
7
M
C23
0.01
P6010
1
6
P6704
POSITION 3
P6813
P6803
P6003
3
3
3
12
STOP
A1
7
26
E3
36
6
10
POSITION 1
P6813
P6803
P6003
1
1
1
11
EJECT
A0
9
25
PC0
MODE SELECT SW
CASSETTE DOWN SWITCH
PD1
30

Figure 2-30. Loading Motor Circuit.

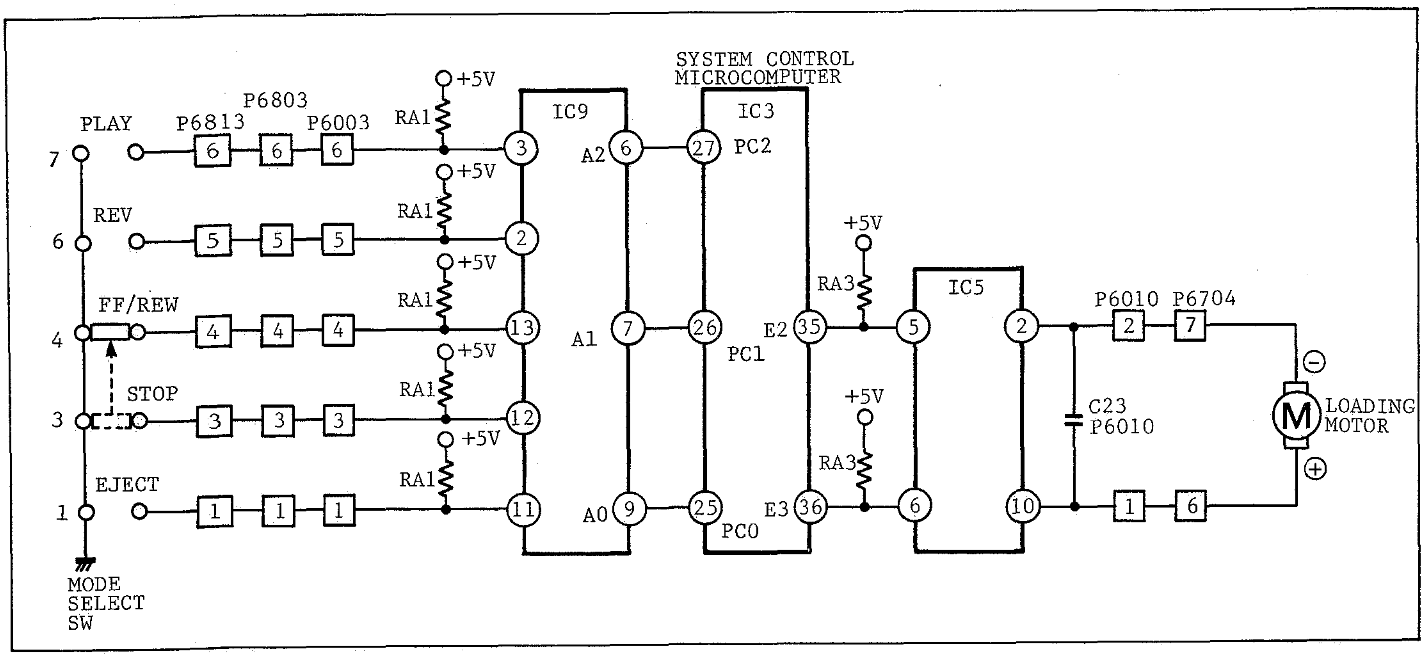

SYSTEM CONTROL
MICROCOMPUTER
PLAY
P6813
P6803
P6003
RA1
+5V
IC9
IC3
PC2
A2
REV
FF/REW
STOP
EJECT
A1
A0
PC1
PC0
E2
E3
RA3
IC5
P6010
P6704
C23
P6010
LOADING
MOTOR
M
MODE
SELECT
SW
7
6
4
3
1

Figure 2-32. Sub-Loading Motor Circuit

1-8. POWER INTERRUPT

When a power failure occurs during the FF/REW, Search Forward or Search Reverse mode, the Power Interrupt circuit instantly drives the reel motor in either FF or REW mode, and drives the loading motor in the FF or REW mode. These actions prevent tape slack.

When the power is resumed, and so that the unit returns to the STOP mode.

When a power failure occurs during the FF or REW mode, Q3 instantly turns OFF, Q4 and Q5 turn ON, and C10 is momentarily discharged. In this way, power is supplied to the Loading Motor Drive circuit, and a high signal for turning the capstan motor off is supplied to the Servo circuit.

When Q4 turns ON, Q6 instantly turns off so that the high signal is applied to IC5 pin 6, then unloading is performed in either the FF or REW mode.

In the Search Forward, PLAY, and REC/PLAY modes, a high signal from IC3 pin 7 is applied to C41 through Q27.

When a power failure occurs, C41 is momentarily discharged, Q28, Q29 turn ON, and Q30 turns OFF so that the high signal is applied to Q19 and Q21 through inverters Q53 and Q54, and Reel Motor momentarily rotates clockwise. Transistors Q3, Q4 and Q5 work in the FF and REW modes.

In the Search Reverse mode, a low signal is applied from IC3 pin 7 to C41 through Q27.

When a power failure occurs during this mode, C41 is not discharge, Q28 and Q29 turn OFF and Q30 turns ON so that the low signal is applied to the base of Q21 and Q19 through inverters Q53 and Q54, and the Reel Motor momentarily rotates counterclockwise.

Transistors Q3, Q4, Q5 work in the FF and REW modes. See in Figure 2-33.

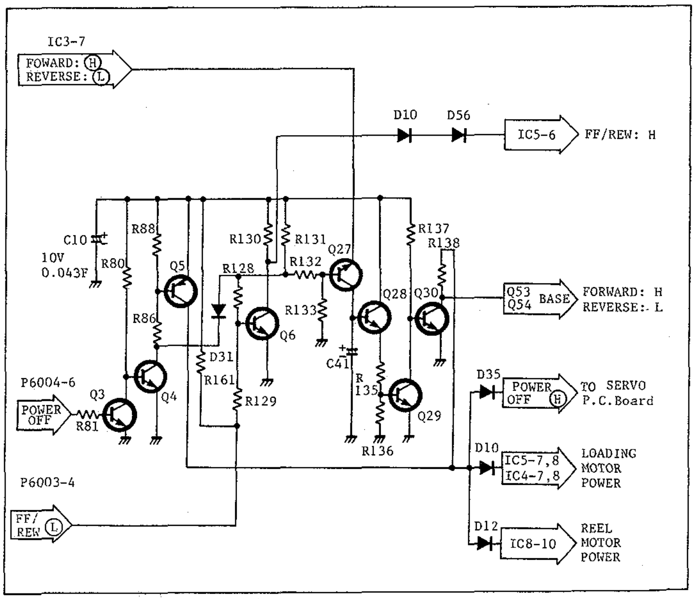

IC3-7
FOWARD: H
REVERSE: L
D10
D56
IC5-6
FF/REW: H
C10
10V
0.043F
R88
R80
Q5
R86
R130
R131
Q27
R128
R132
R133
Q6
D31
R161
R129
C41
Q28
Q30
R137
R138
R 135
R136
Q29
Q53
Q54
BASE
FORWARD: H
REVERSE: L
P6004-6
POWER OFF
R81
Q3
Q4
D35
POWER OFF H
TO SERVO
P.C.Board
D10
IC5-7,8
IC4-7,8
LOADING
MOTOR
POWER
P6003-4
FF/ REW L
D12
IC8-10
REEL
MOTOR
POWER

Figure 2-33. Power Interrupt Circuit.

1-9. REEL MOTOR DRIVE

The Reel Motor circuit controls the direction and torque of the Reel Motor. When either the PLAY or FF mode is activated, IC3 pin 7 goes high, activating Q53, Q54 and Q19, and activating QC and QA in IC8 so that the reel motor current flows as shown below.

Q6402 → D24 → IC8-pin 10 → QC

IC8-pin 7 → REEL Ⓜ → IC8-pin 3 → QA

IC8-pin 1 → R109 → Ground

Figure 2-34. Reel Motor Current Flow in the PLAY Mode.

When REW mode is activated, IC3 pin 7 goes Low, activating Q53, Q54, Q21 and Q20, and activating QD and QB in IC8 so that the reel motor current flows as shown below.

Q6402 → D24 → IC8-pin 10 → QD

IC8-pin 8 → REEL Ⓜ → IC8-pin 5 → QB

IC8-pin 1 → R109 → Ground

Figure 2-35. Reel Motor Current Flow in the REW Mode.

In the PLAY mode, IC6 pin 13 turns high, and the controlled voltage is applied via R103 to the Current Feedback circuit, IC7 pin 6.

The other input of this Current Feedback circuit is IC7 pin 5, which is connected to R110. Thus, the output of this Current Feedback circuit, IC7 pin 7, controls the collector voltage of Q34. In the FF, REW, Search Forward and Search Reverse modes, the Current Feedback circuit is not made available to IC6 pin 13, thus inhibiting the Current Feedback circuit. Only the Voltage Feedback circuit which is controlled by IC6 pin 8 is made available.

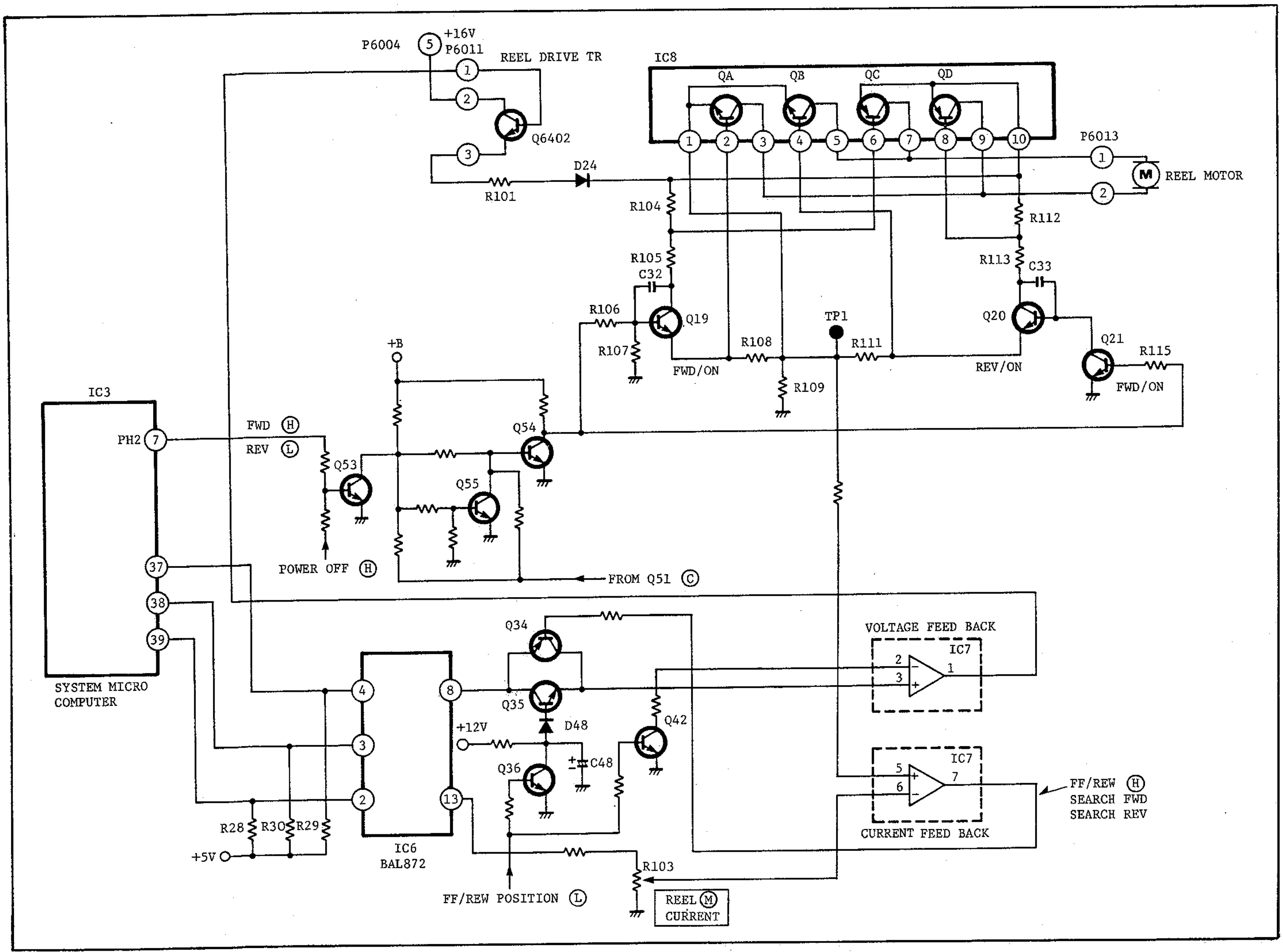

P6004
5
+16V
P6011
1
2
3
REEL DRIVE TR
Q6402
D24
R101
IC8
QA
QB
QC
QD
1
2
3
4
5
6
7
8
9
10
P6013
1
2
REEL MOTOR
R104
R105
C32
R106
R107
Q19
FWD/ON
R108
R109
TP1
R111
R112
R113
C33
Q20
REV/ON
Q21
R115
FWD/ON
+B
IC3
PH2
7
FWD Ⓗ
REV Ⓛ
Q53
Q54
Q55
POWER OFF Ⓗ
FROM Q51 Ⓒ
37
38
39
SYSTEM MICRO COMPUTER
4
3
2
8
13
IC6
BAL872
R28
R30
R29
+5V
Q34
Q35
D48
+12V
Q36
C48
Q42
R103
FF/REW POSITION Ⓛ
REEL Ⓜ CURRENT
VOLTAGE FEED BACK
IC7
2
3
1
IC7
5
6
7
CURRENT FEED BACK
FF/REW Ⓗ
SEARCH FWD
SEARCH REV

Figure 2-36. Reel Motor Drive Circuit.

The relationship between each mode and IC status are shown in Figure 2-38.

IC No.	IC3	IC6					
PIN NO. / MODE	7	2	3	4	8	9	13
STOP	H	L	L	L	0V	0.3V	1V
FF	H	H	L	L	9.5V	9.7V	0V
REW	L	H	L	L	9.5V	9.7V	1V
PLAY REC	H	L	H	L	4.5V	4.3V	4V
UNLOADING	L	L	L	H	3.7V	4.3V	4V
SEARCH FWD	H	L	H (4.8V)	L	4.3V	4.0V	3.7V
x 1/2	H	H	H	H	4.3V	4.0V	3.7V
FAST	H	L	H	H	7.6V	5.7V	1V
SLOW	H	H	H	L	4V	2.4V	⎍
SEARCH REV	L	L	H (4.8V)	H (4.8V)	7.6V	4.1V	1V
x 1/2	L	H	H	H	5.6V	4.1V	1V
FAST	L	L	H	H	7.6V	6.2V	1V
STILL	H	H	H	H	4V	2.3V	1V

Figure 2-38. IC Status

1-10. Tape Slack Prevention Circuit

By regulating the reel motor drive current, this circuit effectively prevents the tape from any slack when the deck enters Unloading from either the Play or Reverse mode.

A High voltage available for Unloading is first fed from IC pin 36 to C57 to charge it. Potential at IC13 pin 5 gradually rises, and as soon as it exceeds the threshold level held at IC13 pin 6, a High voltage is output from IC13 pin 7, which is then differentiated by C58 to cause a current to flow through R103 so that the tape will be prevented from any slack when Unloading is entered. See the block diagram of this circuit operation below.

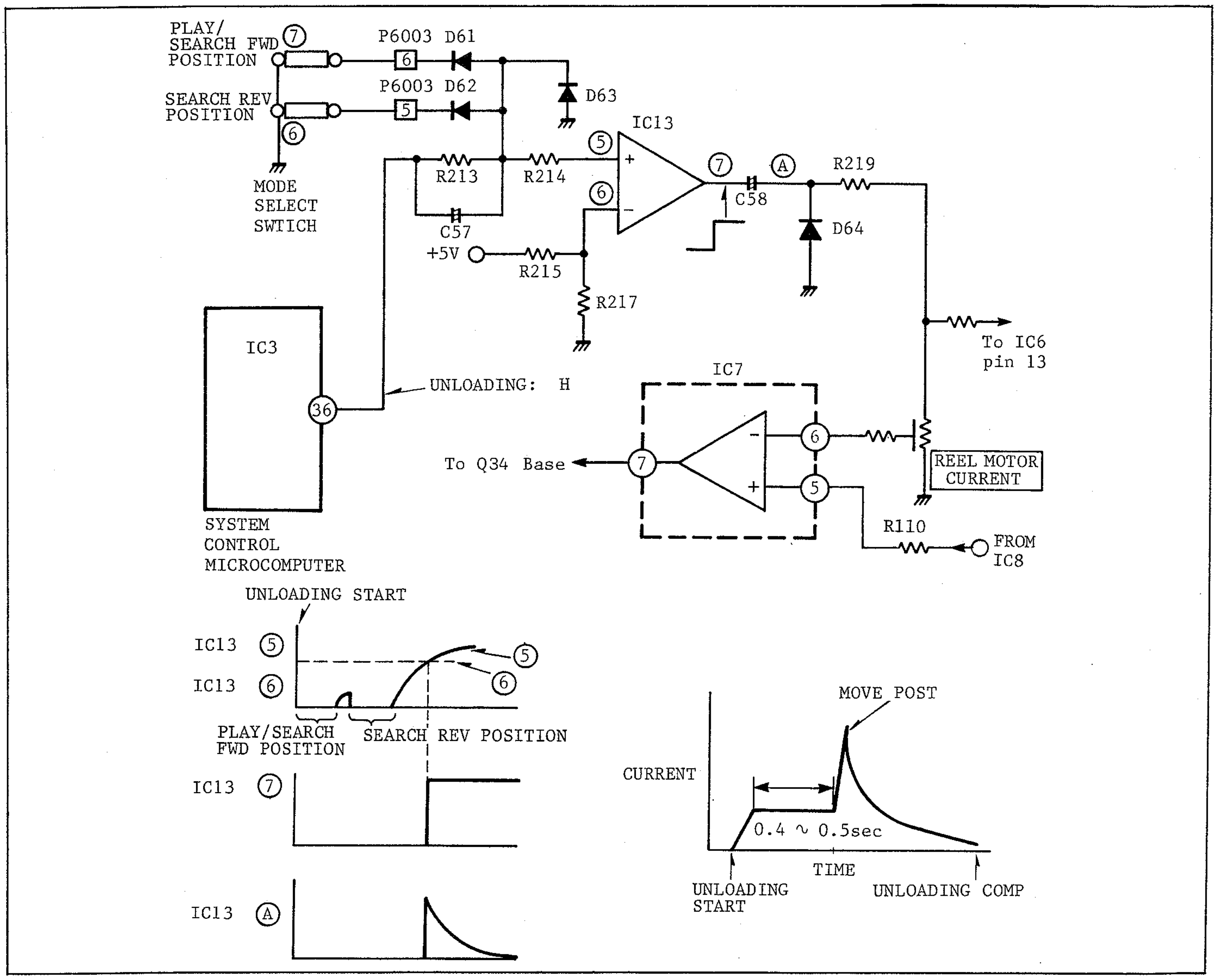

PLAY/
SEARCH FWD ⑦
POSITION
SEARCH REV
POSITION
⑥
MODE
SELECT
SWTICH
P6003 D61
6
P6003 D62
5
D63
IC13
⑤
⑥
⑦
Ⓐ
R213
R214
C57
+5V
R215
R217
C58
R219
D64
To IC6
pin 13
IC3
36
SYSTEM
CONTROL
MICROCOMPUTER
UNLOADING: H
IC7
To Q34 Base
⑦
⑥
⑤
REEL MOTOR
CURRENT
R110
FROM
IC8
UNLOADING START
IC13 ⑤
IC13 ⑥
⑤
⑥
PLAY/SEARCH
FWD POSITION
SEARCH REV POSITION
IC13 ⑦
IC13 Ⓐ
MOVE POST
CURRENT
0.4 ∿ 0.5sec
TIME
UNLOADING
START
UNLOADING COMP

Figure 2-37. Tape Slack Prevention Circuit.

1-11. Tension Decreasing Circuit (During Stop mode)

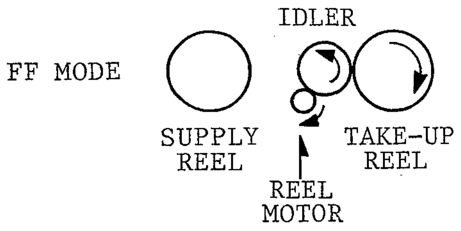
Specifically, this circuit decreases the tape tension by reversing the rotation of the Reel motor when the deck enters Stop from either the FF or Rewind mode. The circuit operation is described below.

When the deck enters Stop mode from the FF mode

A High voltage from P6010 pin 1 (IC5 pin 10) available for Unloading operation enters the base of Q54 via R195, and so Q54 turns ON with its collector turning Low to cause the Reel motor to rotate counterclockwise. See Figure 2-39 and 2-41.

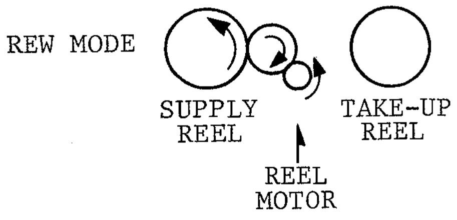
When the deck enters Stop mode from the REW mode

A High voltage from P6010 pin 1 available for Unloading operation enters via R195. Separately, a Reverse High voltage is output from the collector of Q53. The Unloading High signal then goes through R208 and the AND logic circuit of D59 before it enters the base of Q55. Since Q55 is ON, voltage at the base of Q54 goes Low, turning its collector High, causing the Reel motor to rotate counterclockwise to eventually decrease the tape tension when Stop is entered. See Figure 2-40 and 2-41.



Q54 Collector Voltage	
FF MODE	During Unloading Mode (FF REW POSITION → STOP POSITION)
H	L

Figure 2-39. FF Mode.



Q54 Collector Voltage	
REW MODE	During Unloading Mode (FF REW POSITION → STOP POSITION)
L	H

Figure 2-40. REW Mode.

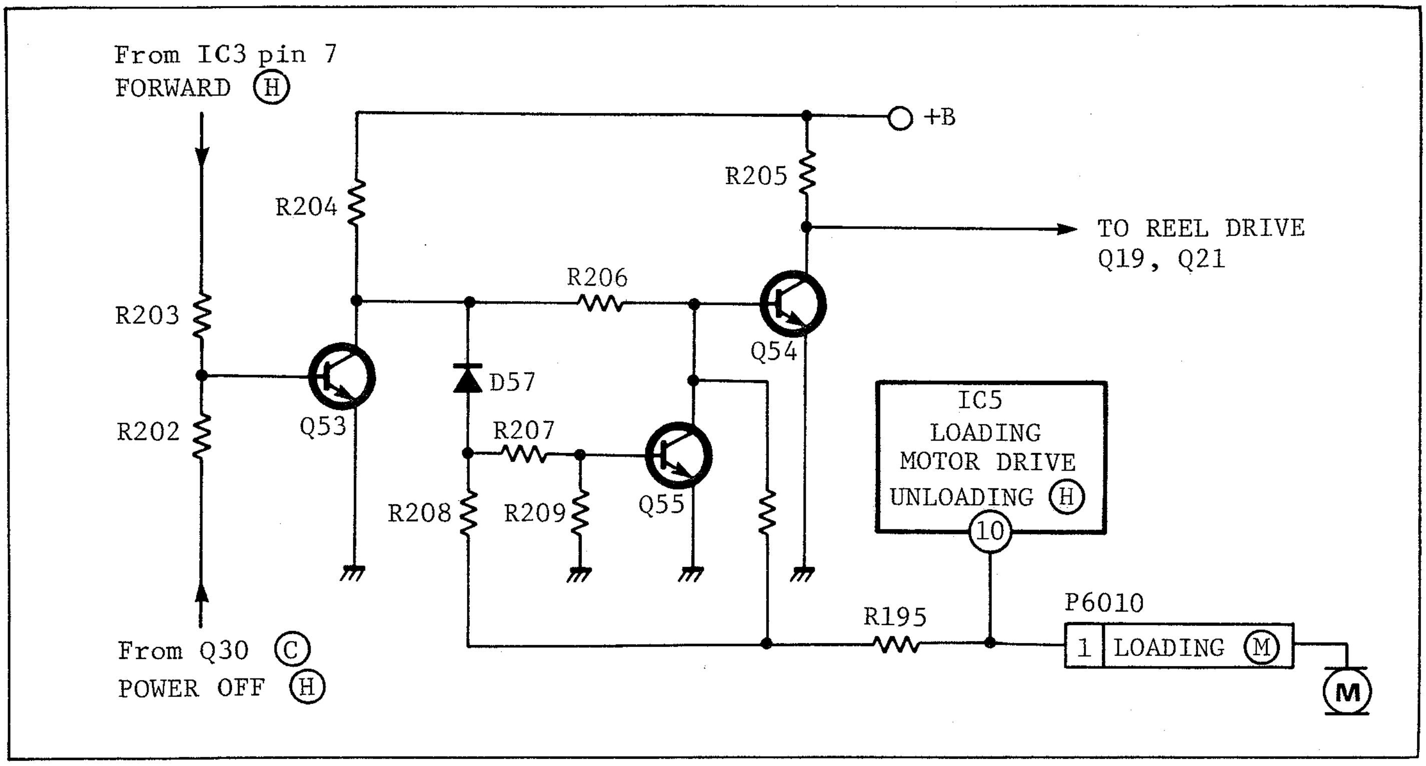

From IC3 pin 7
FORWARD (H)
+B
R205
R204
TO REEL DRIVE
Q19, Q21
R206
R203
Q54
D57
R202
Q53
R207
IC5
LOADING
MOTOR DRIVE
UNLOADING (H)
10
R208
R209
Q55
R195
P6010
1
LOADING (M)
M
From Q30 (C)
POWER OFF (H)

Figure 2-41. Tension Decreasing Circuit.

1-12. Tension Decreasing Circuit (From FF/REW to Stop)

When Stop is entered from either the FF or Rewind mode, a High voltage from IC3 pin 36 enters R170, while the FF/REW Low voltage is fed to the base of Q41, causing its collector to go High when either the FF or Rewind mode is entered while Unloading is performed. Transistor Q40 then turns ON to mute a voltage flowing into IC7 pin 3 so that the tape tension will decrease when the deck enters Stop from either the FF or Rewind mode. See Figure 2-42.

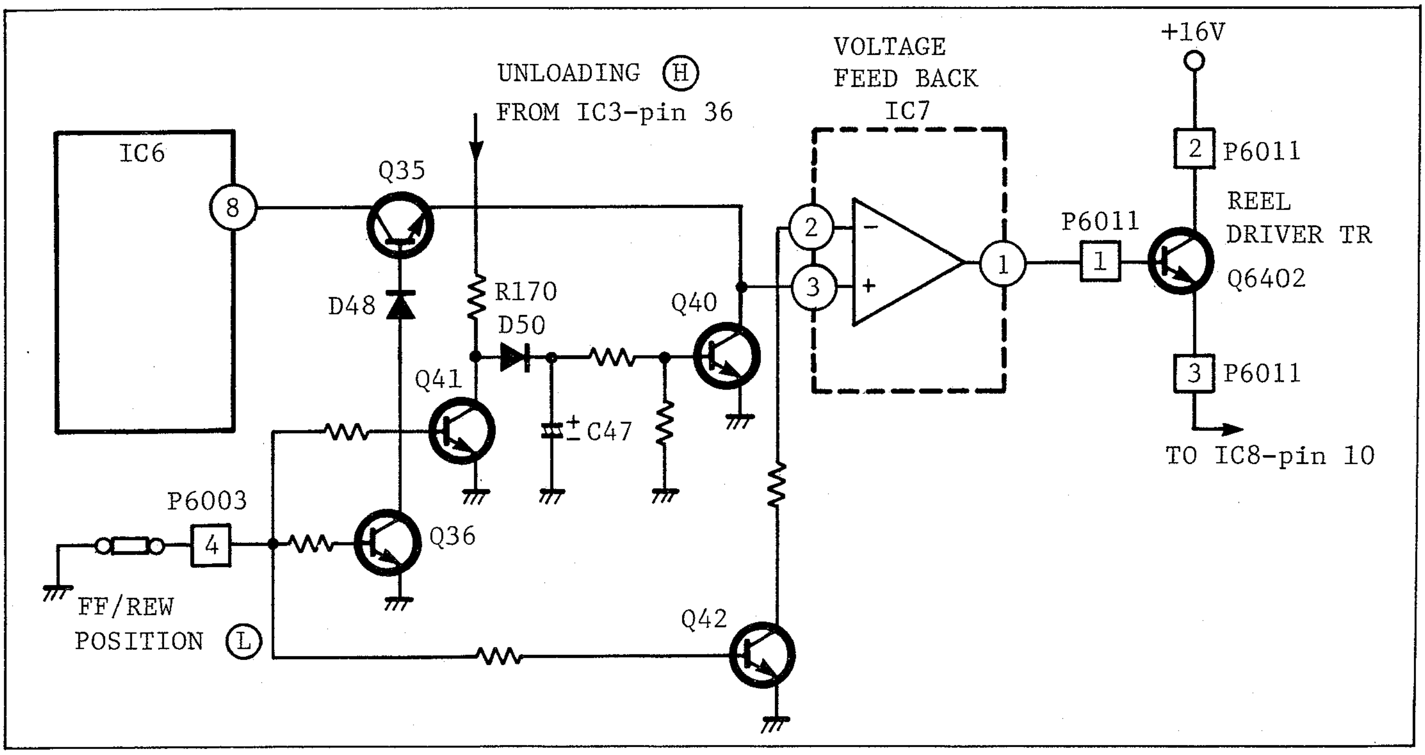

UNLOADING (H)
FROM IC3-pin 36
VOLTAGE
FEED BACK
IC7
+16V
IC6
8
Q35
2
3
1
P6011
2
P6011
1
REEL
DRIVER TR
Q6402
R170
D48
D50
Q40
Q41
C47
3
P6011
TO IC8-pin 10
P6003
4
Q36
FF/REW
POSITION (L)
Q42

Figure 2-42. Tension Decreasing Circuit.

1-13. Tape End Quick-Detection Circuit

Mechanism incorporated in AG-6800 makes it possible to correctly search the tape end position using either X10 Forward or X10 Reverse run with Remote controller AG-A600.
Since the tape may possibly be damaged at its end if wound up at 10 times speed, the present mechanism provides the Tape End Quick Detection Circuit so that the tape will be protected from any damage.

As soon as the translucent portion of the tape appears, a Low pulse is sent to either IC1 pin 1 or pin 2, turning Q25 ON. A High voltage integrated by C40 is then fed to the base of Q26 to turn it ON.

As soon as the translucent portion of the tape appears at the end, a High voltage is output from IC2 pin 8 via IC2 pins 9/8 and inverter, which then goes through P6007 pin 9 before eventually entering the Servo Circuit, causing the Capstan motor to quickly stop.
See Figure 2-43.

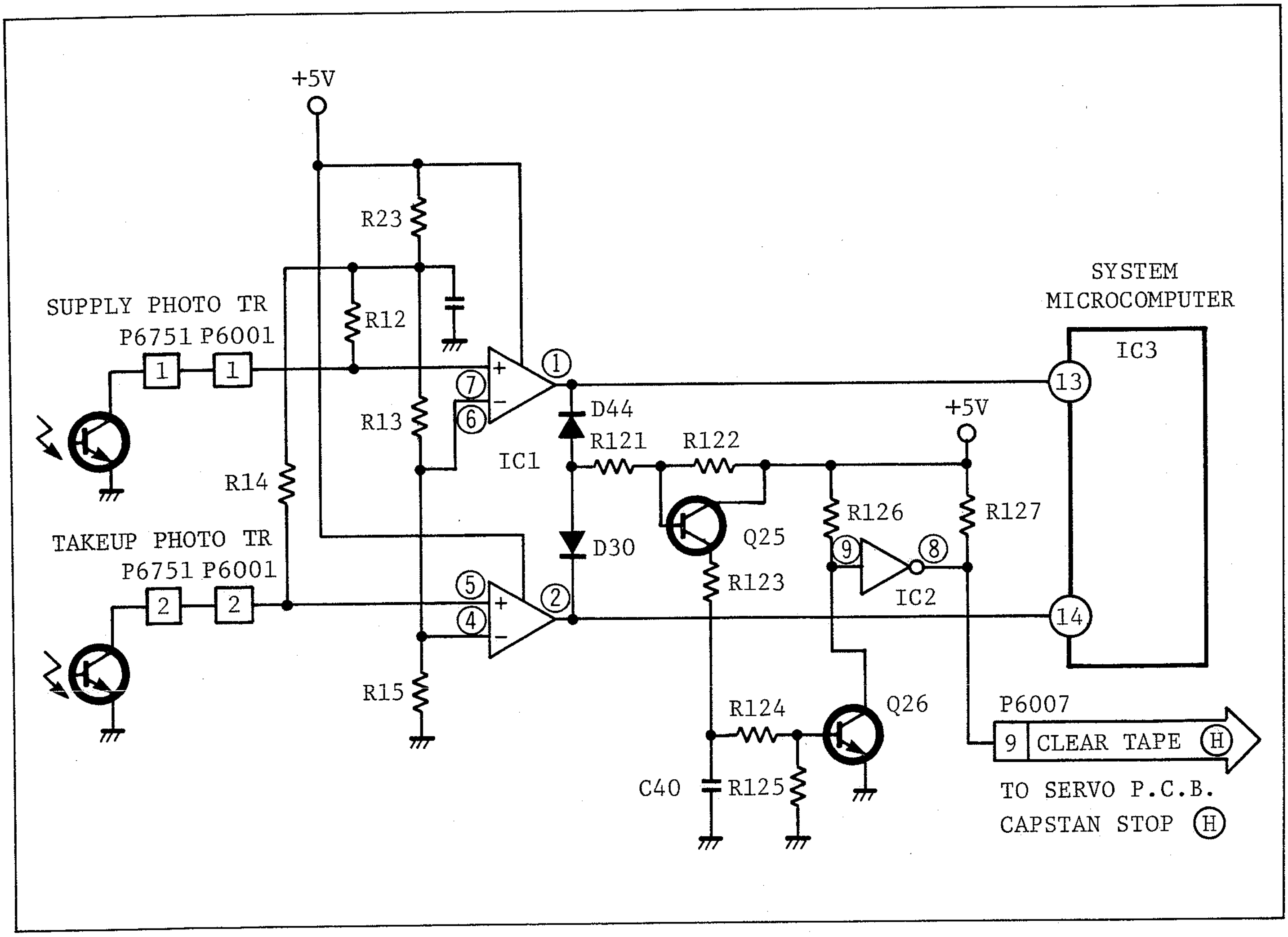

+5V
R23
R12
SUPPLY PHOTO TR
P6751 P6001
1
1
⑦
⑥
①
R13
IC1
R14
TAKEUP PHOTO TR
P6751 P6001
2
2
⑤
④
②
R15
D44
R121
R122
D30
Q25
R123
+5V
R126
R127
⑨
⑧
IC2
R124
Q26
C40
R125
SYSTEM
MICROCOMPUTER
IC3
⑬
⑭
P6007
9
CLEAR TAPE Ⓗ
TO SERVO P.C.B.
CAPSTAN STOP Ⓗ

Figure 2-43. Quick Tape End Detection.

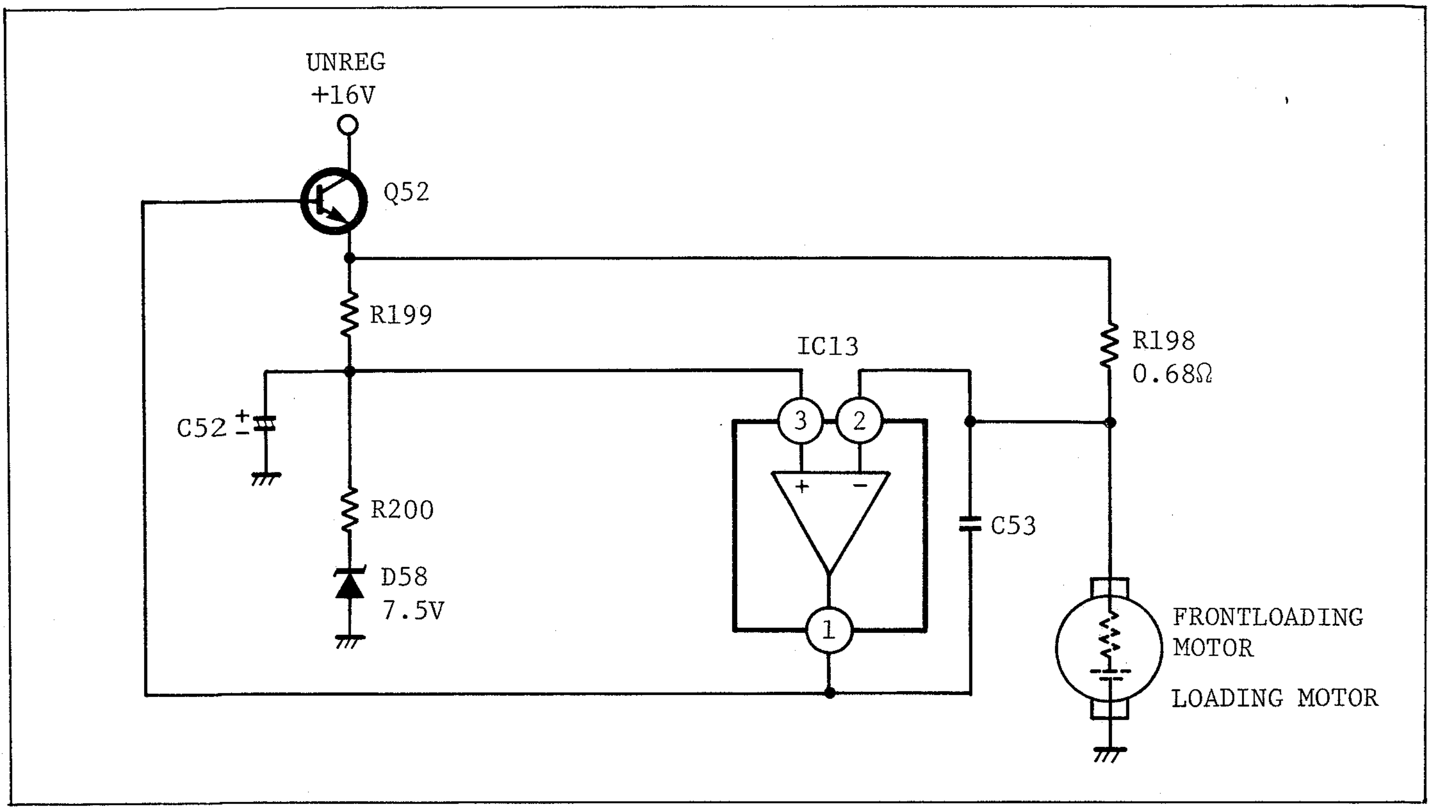


Figure 2-44. Speed Stabilization Circuit.

1-14. Speed Stabilization Circuit coping with variable motor load

During either Loading or Unloading, or when the Front Loading motor either ascends or decends, the motor load is variable. Coping with any variation, this circuit effectively stabilizes the speed of the motor rotation.
For example, the motor speed lowers when the motor load grows, causing the voltage driving the motor to also lower, and as a result, a positive voltage is generated at IC13 pin 1 after the motor voltage is compared to 7.5V of the voltage held by Zener diode D58. Since IC13 pin 1 is connected to the base of Q52, amount of current flowing through emitter and collector of Q52 increases, causing the motor to rotate at faster speed.
Conversely, if the motor speed increases, the motor voltage also rises to cause a negative voltage to appear at IC13 pin 1. As a result, amout of current flowing through Q52 will decrease, causing the motor to rotate at a slow speed.
As described above, this circuit effectively controls the motor load so that any excessive load will decrease.

2. Front Microcomputer Circuit

General Description

The Front Microcomputer Circuit is located on the front panel. The purpose of this circuit is to sense the operating modes selected by the manual key switches on the front panel.

Figure 2-45 shows the input and output signals at each pin of the microcomputer IC1.

PIN NO.	NAME	I/O	Function	ACTIVE
1	PG0	OUT	Key Scan Pulse	See Figure 2-46
2	PG1	OUT		
3	PG2	OUT		
4	PG3	—	Not Used	———
5	PH0	OUT	Serial Data Inhibit Signal	———
6	PH1	—	Not Used	———
7	PH2	—		
8	PH3	—		
9	S1	IN	Serial Information Signal	———
10	SO	OUT	Serial Information Signal	———
11	$\overline{\text{SCK}}$	IN	Serial Clock Signal	———
12	PA0	IN	Address Information Signal	———
13	PA1	IN	+5V	+5V
14	PA2	IN		
15	PA3	IN	Search Dial Rotated	———
16	PB0	IN		
17	PB1	IN		
18	PB2	IN		
19	PB3	+B	Not Used	+B
20	TEST	GND	Not Used	GND
21	GND	GND	GND	GND
22	X1	IN	Microcomputer Clock signal	3.58MHz
23	X2	IN		
24	$\overline{\text{RES}}$	IN	Reset Signal	Ⓛ
25	PC0	OUT	Noise Reduction Mode	Ⓗ
26	PC1	OUT	GND	———
27	PC2	IN	Timer REC Mode	Ⓛ
28	PC3	IN	Timer PLAY Mode	Ⓛ
29	PD0	IN	Key Scan Pulse	———
30	PD1	IN		
31	PD2	IN		
32	PD3	IN		
33	PE0	OUT	LED Column Scan Pulse	See Figure 2-47
34	PE1	OUT		
35	PE2	OUT		
36	PE3	OUT	Not Used	———
37	PF0	OUT	LED Row Scan Pulse	———
38	PF1	OUT		
39	PF2	OUT		
40	PF3	OUT		
41	VCC	IN	+5V	+5V
42	$\overline{\text{INT}}$	IN	External Interrupt Signal	———

Figure 2-45. Front Microcomputer I/O Table

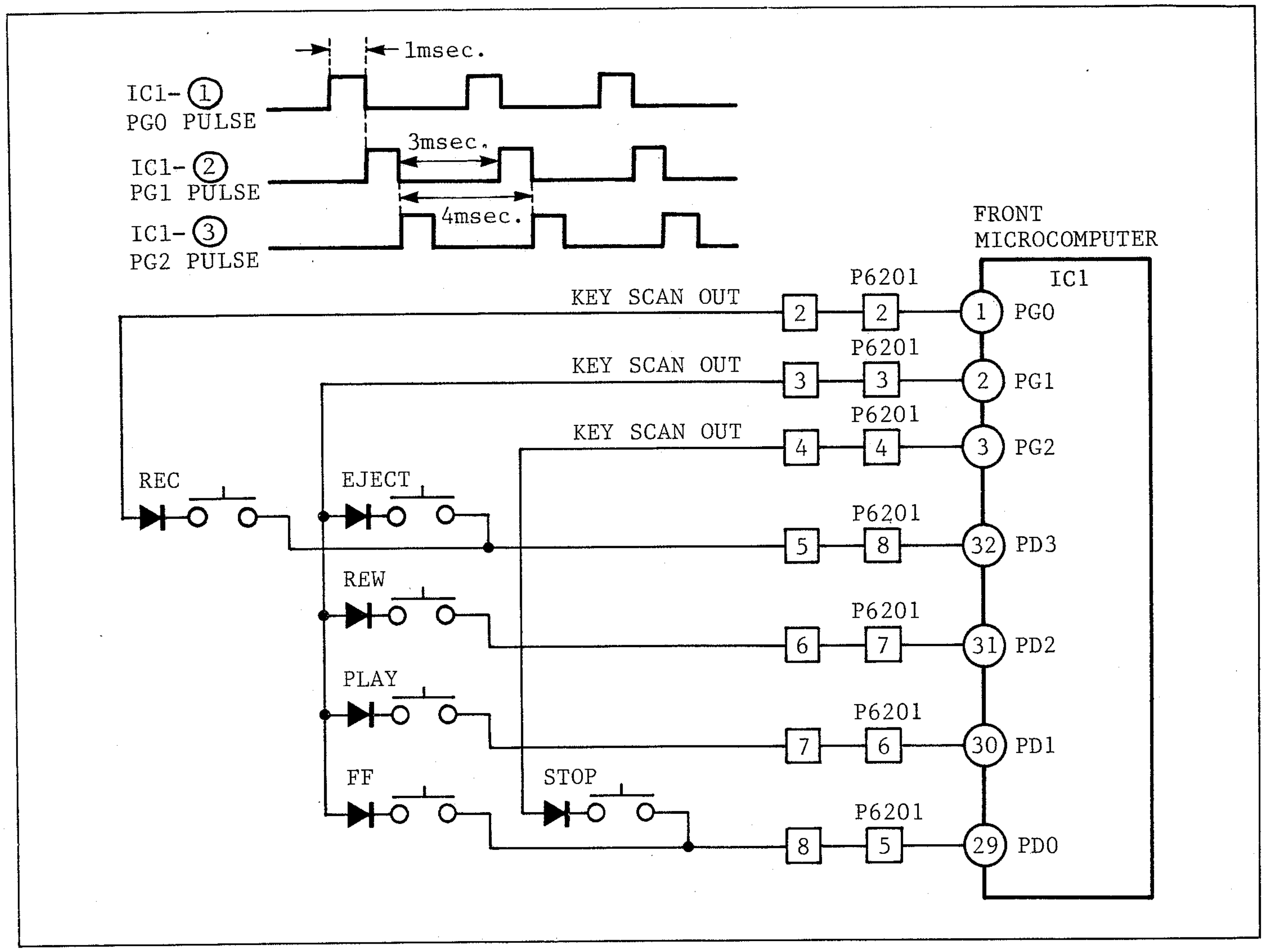

1msec.
IC1-①
PG0 PULSE
3msec.
IC1-②
PG1 PULSE
4msec.
IC1-③
PG2 PULSE
FRONT
MICROCOMPUTER
IC1
P6201
KEY SCAN OUT
PG0
PG1
PG2
PD3
PD2
PD1
PD0
REC
EJECT
REW
PLAY
FF
STOP

Figure 2-46. Key Matrix Circuit

Detailed Description

2-1. KEY MATRIX CIRCUIT

A key matrix circuit is used to select the desired mode. Refer to Figure 2-46. When an operation key is pressed, the scan pulses go to the operation keys and one of the scan pulses is returned to the Front Microcomputer.
The key data is then fed back to the System Control Microcomputer IC3 through the serial data line.

2-2. LED ILLUMINATION

A LED illumination circuit is used to illuminate the desired mode LED when an operation key is pressed, and is performed by the Front Microcomputer IC1.

For example, when the FF key is pressed a Low signal is sent from IC1 pin 34 to the transistor Q3 base, and Q3 turns on. At the same time, IC1 pin 37 goes High and Q10 turns on. FF LED is therefore illuminated from the +5V circuit through ON transistors Q3 and Q10.

2-3. SERIAL DATA INHIBIT CIRCUIT

While reading serial data, IC1 pin 5 remains High, turning transistor Q5 ON and Q6 OFF. While the serial data is either being read by or output from the Front microcomputer, IC1 pin 5 remains Low, turning transistor Q5 OFF so that the serial data can be output from IC1 pin 6 via Q6.

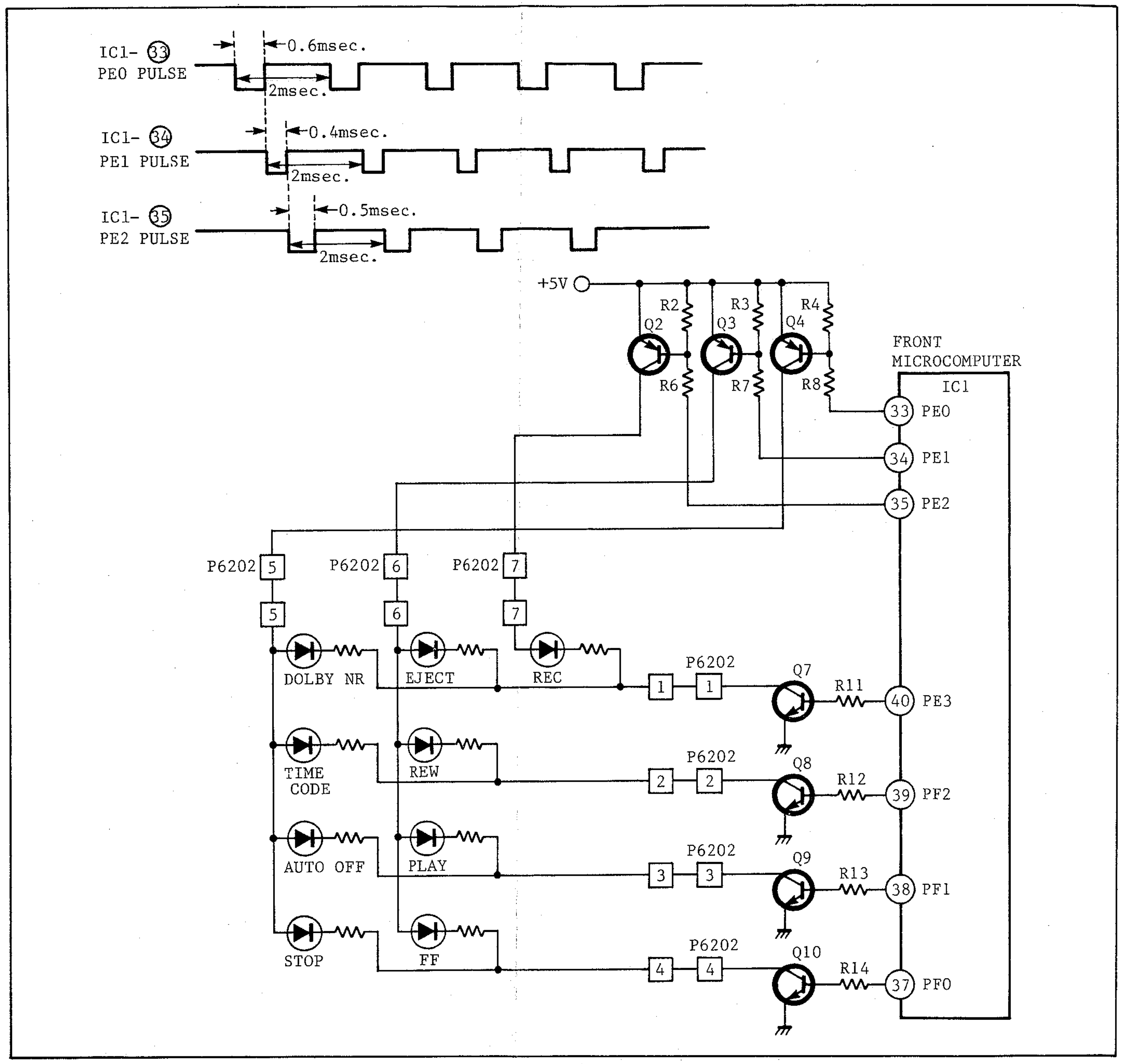

IC1-㉝
PE0 PULSE
0.6msec.
2msec.
IC1-㉞
PE1 PULSE
0.4msec.
2msec.
IC1-㉟
PE2 PULSE
0.5msec.
2msec.
+5V
R2
R3
R4
Q2
Q3
Q4
R6
R7
R8
FRONT
MICROCOMPUTER
IC1
PE0
PE1
PE2
P6202
DOLBY NR
EJECT
REC
TIME CODE
REW
AUTO OFF
PLAY
STOP
FF
Q7
Q8
Q9
Q10
R11
R12
R13
R14
PE3
PF2
PF1
PF0

Figure 2-47. LED Illumination Circuit.

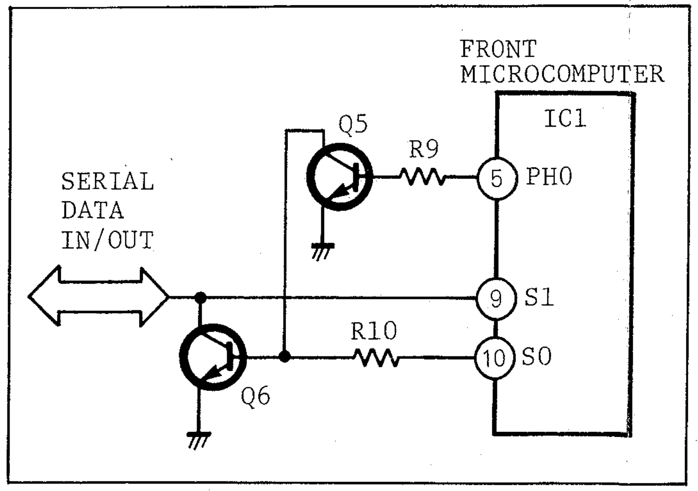

FRONT
MICROCOMPUTER
IC1
Q5
R9
PH0
SERIAL
DATA
IN/OUT
S1
R10
S0
Q6

Figure 2-48. Serial Data Inhibit Circuit

3. Counter Microcomputer Circuit

General Description

The Counter Microcomputer circuit is located on the right side of front panel. The functions of this circuit are as follows:

1. Elapsed Tape Time display function
2. Remaining Tape Time display function
3. Tape Memory function
4. One Time Repeat function
5. Auto Repeat function

Figure 2-50 shows the input and output signals at each pin of the microcomputer IC2.

Detailed Description

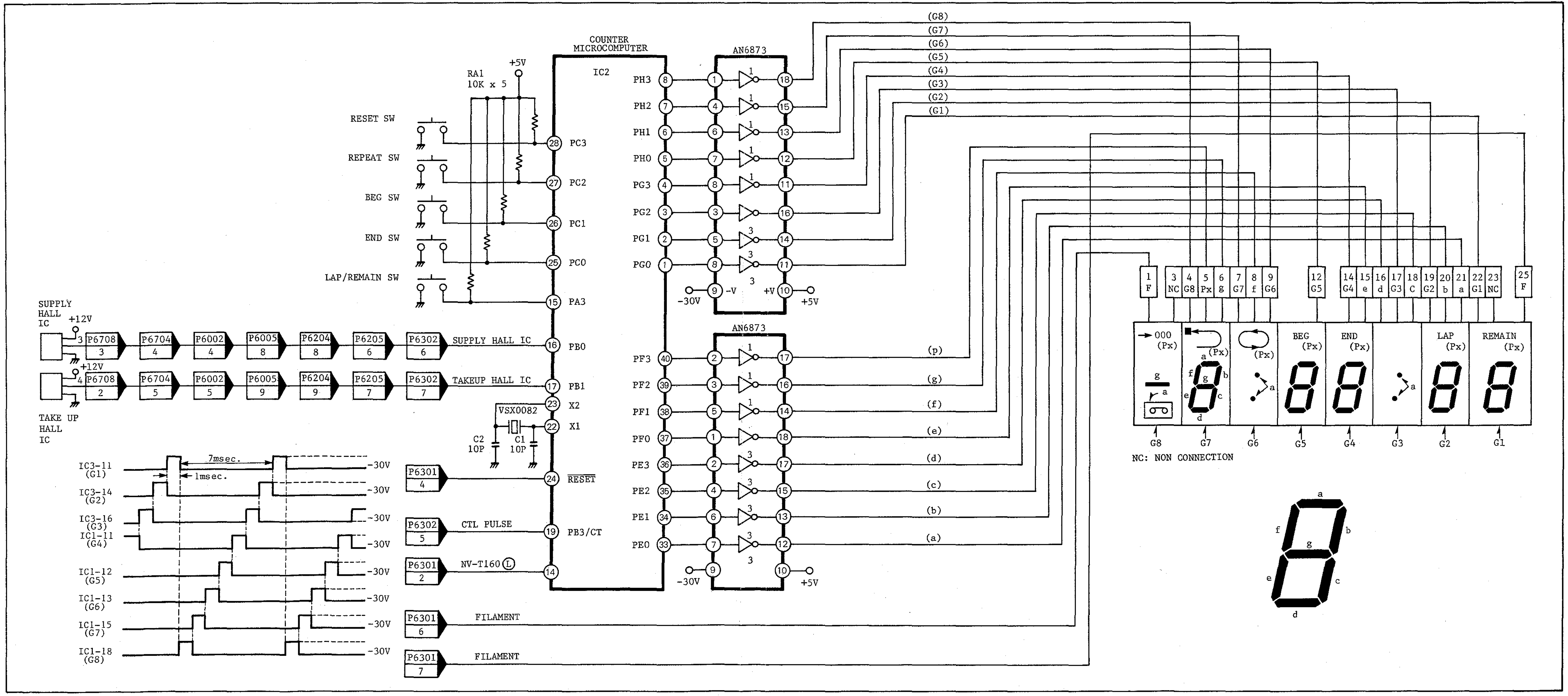
Refer to Figure 2-49 for the descriptions which follow.

3-1. ELAPSED TAPE TIME DISPLAY

The control pulses which were recorded on the tape at a 30Hz rate, are read whenever the tape is in motion and sent to pin 19 of IC2 where the pulses are counted by this microcomputer.

The counter microcomputer (IC2), contains an eight bit event counter which translates the count into an eight digit number formatted into hours, minutes and seconds.
It then sequentially outputs the seven segment output representing one digit of that data at ports E.F pins 33-39. As each digit segment data is outputted, the program also enables one of nine bits from ports F.G.H pins 40, and 1-8 of IC2, one bit at a time.

Sequencing of the segment and digit data outputs is done by interrupt pulses (500μs) generated by the System Control Microcomputer.
The interrput routine rolls the counter and changes the display to the next digit after each 8 milliseconds.



COUNTER MICROCOMPUTER
IC2
AN6873
RA1 10K x 5
+5V
RESET SW
REPEAT SW
BEG SW
END SW
LAP/REMAIN SW
PC3
PC2
PC1
PC0
PA3
PB0
PB1
X2
X1
RESET
PB3/CT
PH3
PH2
PH1
PH0
PG3
PG2
PG1
PG0
PF3
PF2
PF1
PF0
PE3
PE2
PE1
PE0
-30V
-V
+V
(G8)
(G7)
(G6)
(G5)
(G4)
(G3)
(G2)
(G1)
(p)
(g)
(f)
(e)
(d)
(c)
(b)
(a)
SUPPLY HALL IC
+12V
TAKE UP HALL IC
P6708
P6704
P6002
P6005
P6204
P6205
P6302
P6301
SUPPLY HALL IC
TAKEUP HALL IC
VSX0082
C2 10P
C1 10P
CTL PULSE
NV-T160
FILAMENT
FILAMENT
IC3-11 (G1)
IC3-14 (G2)
IC3-16 (G3)
IC1-11 (G4)
IC1-12 (G5)
IC1-13 (G6)
IC1-15 (G7)
IC1-18 (G8)
7msec.
1msec.
-30V
1 F
3 NC
4 G8
5 Px
6 g
7 G7
8 f
9 G6
12 G5
14 G4
15 e
16 d
17 G3
18 c
19 G2
20 b
21 a
22 G1
23 NC
25 F
000 (Px)
(Px)
BEG (Px)
END (Px)
LAP (Px)
REMAIN (Px)
G8
G7
G6
G5
G4
G3
G2
G1
NC: NON CONNECTION
a
b
c
d
e
f
g

Figure 2-49. Counter Microcomputer Circuit

PIN NO.	NAME	I/O	Function	ACTIVE
1	PG0	OUT	(G1) Segment Scan Pulse	See Figure 2-49
2	PG1	OUT	(G2)	
3	PG2	OUT	(G3)	
4	PG3	OUT	(G4)	
5	PH0	OUT	(G5)	
6	PH1	OUT	(G6)	
7	PH2	OUT	(G7)	
8	PH3	OUT	(G8)	
9	S1	IN	Serial Information Signal	———
10	S0	OUT	Serial Information Signal	———
11	$\overline{\text{SCK}}$	IN	Serial Clock Signal	———
12	PA0	IN	Address Information	———
13	PA1	GND	Not Used	GND
14	PA2	IN	NV-T160 Position Selected	Ⓛ
15	PA3	IN	LAP/REMAIN Switch Depressed	Ⓛ
16	PB0	IN	Supply Hall IC Signal	———
17	PB1	IN	Takeup Hall IC Signal	———
18	PB2	GND	Not Used	GND
19	PB3	IN	CTL Signal	———
20	TEST	GND	Not Used	GND
21	GND	GND	GND	GND
22	X1	IN	Microcomputer Clock signal	3.58MHz
23	X2	IN		
24	$\overline{\text{RES}}$	IN	Reset Signal	Ⓛ
25	PC0	IN	END Switch Depressed	Ⓛ
26	PC1	IN	BEG Switch Depressed	Ⓛ
27	PC2	IN	REPEAT Switch Depressed	Ⓛ
28	PC3	IN	RESET Switch Depressed	Ⓛ
29	PD0	IN	BEG. END Auto Repeat Mode Selected	Ⓛ
30	PD1	IN	CTL Auto Repeat Mode Selected	Ⓛ
31	PD2	GND	Not Used	GND
32	PD3	OUT	Serial Data Inhibit Signal	GND
33	PE0	OUT	(a) Segment Data Signal	———
34	PE1	OUT	(b)	
35	PE2	OUT	(c)	
36	PE3	OUT	(d)	
37	PF0	OUT	(e)	
38	PF1	OUT	(f)	
39	PF2	OUT	(g)	
40	PF3	OUT	(p/x)	
41	VCC	IN	+5V	+5V
42	$\overline{\text{INT}}$	IN	External Interrupt Signal	———

Figure 2-50. Counter Microcomputer I/O Table.

3-2. REMAINING TAPE TIME DISPLAY

When the Remaining time key is pressed in the Record or Normal Playback, the Elapsed Tape Time display is replaced by the Remaining Tape time indication. For example, display of "1:32" indicates that the tape time remaining is 1 hour and 32 minutes.
Note that display of "C" signifies that the remaining tape time is being computed.
When the Remaining Tape Time is less than 5 minutes, the Cassette In mark flashes on and off.

The Remaining Tape Time can also be indicated in the Fast Forward, Rewind Search Forward and Search Reverse mode. However, indication in these modes can only be obtained after a Remaining Tape Time calculation has been made in normal Record or Playback.
The AG-6800 display the Remaining Tape Time accurately by dimensionally computing the area of tape on the supply reel and identifying the size of the hubs.

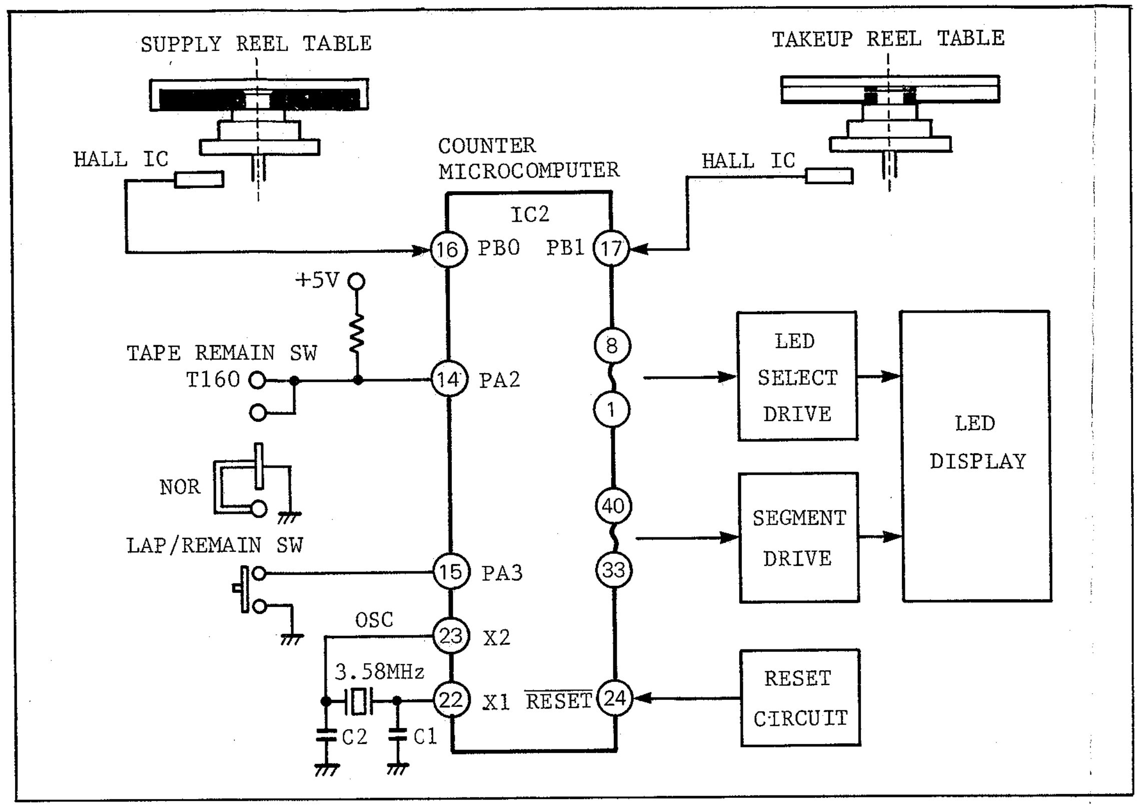


Figure 2-51. Remaining Time Circuit

Items / Tape	Total Length (M)	Hub Diameter (mm)	Tape Thickness (μm)	Tape Area (mm^2)
NV-T160	327 ∿ 330	26 (Small)	15 ∿ 16.3	5,987 ∿ 6,453
NV-T120	246 ∿ 249	26 (Small)	18 ∿ 21.0	5,477 ∿ 6,303
NV-T90	185 ∿ 188	26 (Small)	19 ∿ 20.6	4,564 ∿ 4,965
NV-T60	125 ∿ 128	62 (Big)	18 ∿ 21.0	8,249 ∿ 8,765
NV-T30	64 ∿ 67	62 (Big)	18 ∿ 21.0	7,151 ∿ 7,484
NV-T20	44 ∿ 47	62 (Big)	18.3 ∿ 21.0	6,833 ∿ 7,064
NV-T15	34 ∿ 37	62 (Big)	18.0 ∿ 20.7	6,611 ∿ 6,863

Figure 2-52. Remaining Tape Areas for Various Tapes

There are two sizes of hubs. The smaller hub has a diameter of 26mm and the larger one a diameter of 62mm. Figure 2-52 gives the calculated values of the remaining tape on the supply reel for various tapes and hub diameter.
A simplified block diagram of the Remaining Tape Time display circuit is shown in Figure 2-51.
The reel sensors (HALL IC) detect the rotation cycle of each reel, and input the information to the Counter Microcomputer pins 16 and 17. Using this information, the size of the hub, the hub radius, and tape thickness are then identified by the Counter Microcomputer programming.

3-3. LAP/REMAIN SWITCH

With the LAP/REMAIN switch in the REMAIN position, Low is applied at pin 15 which signals the microcomputer to change the LED display from Elapsed Time to Remaining Tape Time.

3-4. TAPE REMAIN SWITCH

(COMPENSATION FOR TAPE THICKNESS)

When the NV-T160 (NTSC) is used, the TAPE REMAIN switch must be changed from the normal to the T-160 position.
This changes the programming in the microcomputer to account for the smaller thickness of the T-160 tape (as shown in the chart of Figure 2-52).

3-5. CALCULATION OF THE REMAINING TAPE TIME IN THE FF/REW MODE

The remaining tape time is first calculated in the normal playback or record. Then the remaining tape time in the fast forward or rewind mode can be calculated using the normal calculated value as a reference.
The calculation is performed as follows using the formulas shown below.

$t1 = t0 - \Delta t0$ (FF direction)
$t1 = t0 + \Delta t0$ (REW direction)

t1: Remaining tape time being sought
t0: Reference remaining tape time (t0 is calculated in the normal play mode)
$\Delta t0$: Time difference between normal mode and FF/REW modes.

$\Delta t0$ will be determined from a calculation of length of tape being wound in the FF or REW mode.

First, length of tape being wound ($\Delta L0$) is calculated from the number of rotations from a reference point of the tape wound onto the supply reel diameter D1.
$\Delta t0$ is then obtained by dividing the calculated $\Delta L0$ by the tape speed.

3-6. TAPE MEMORY FUNCTIONS

The Tape Memory Functions in the AG-6800 allow the tape to be automatically wound to a desired point, and to automatically playback all or a portion of the tape.
These functions are performed by the Counter Microcomputer circuit components shown in Figure 2-53.

(a) Automatic Tape Restart Point

This function will wind the tape automatically to a desired point by use of the tape Reset and "→000" position of the tape memory switch.
The enter this mode, the Reset switch is pressed which applies a Low at pin 28 of the Counter Microcomputer IC2. This enters the position data into the IC2 RAM area, and resets the display to "0:00:00". Next, the Tape Memory Switch is pressed until the "→000" mark appears on the display. Then, when the Rewind is performed, the stop command will be automatically sent through the serial data line to the other microcomputer when the counter reaches the reset point.
A simplified flow chart of the sequence of events is given in Figure 2-54.

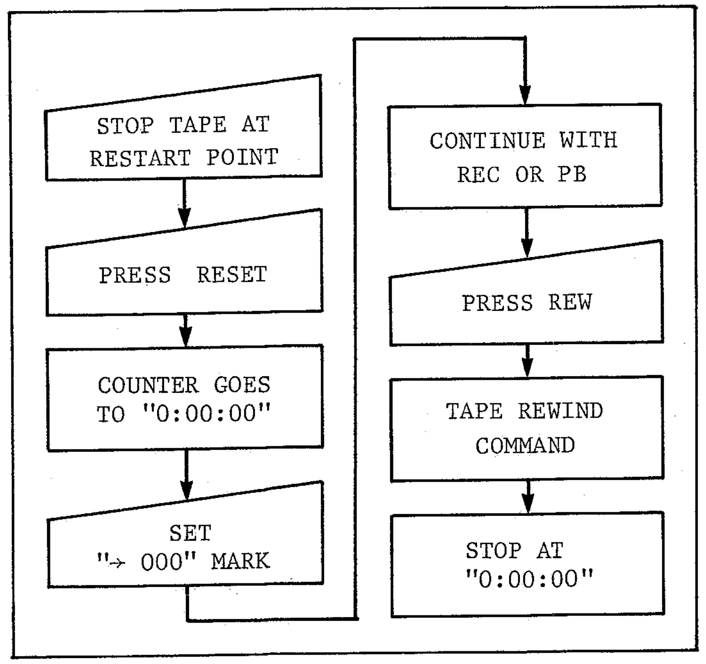

STOP TAPE AT RESTART POINT
PRESS RESET
COUNTER GOES TO "0:00:00"
SET "→ 000" MARK
CONTINUE WITH REC OR PB
PRESS REW
TAPE REWIND COMMAND
STOP AT "0:00:00"

Figure 2-54. Auto Rewind to Preset Point.

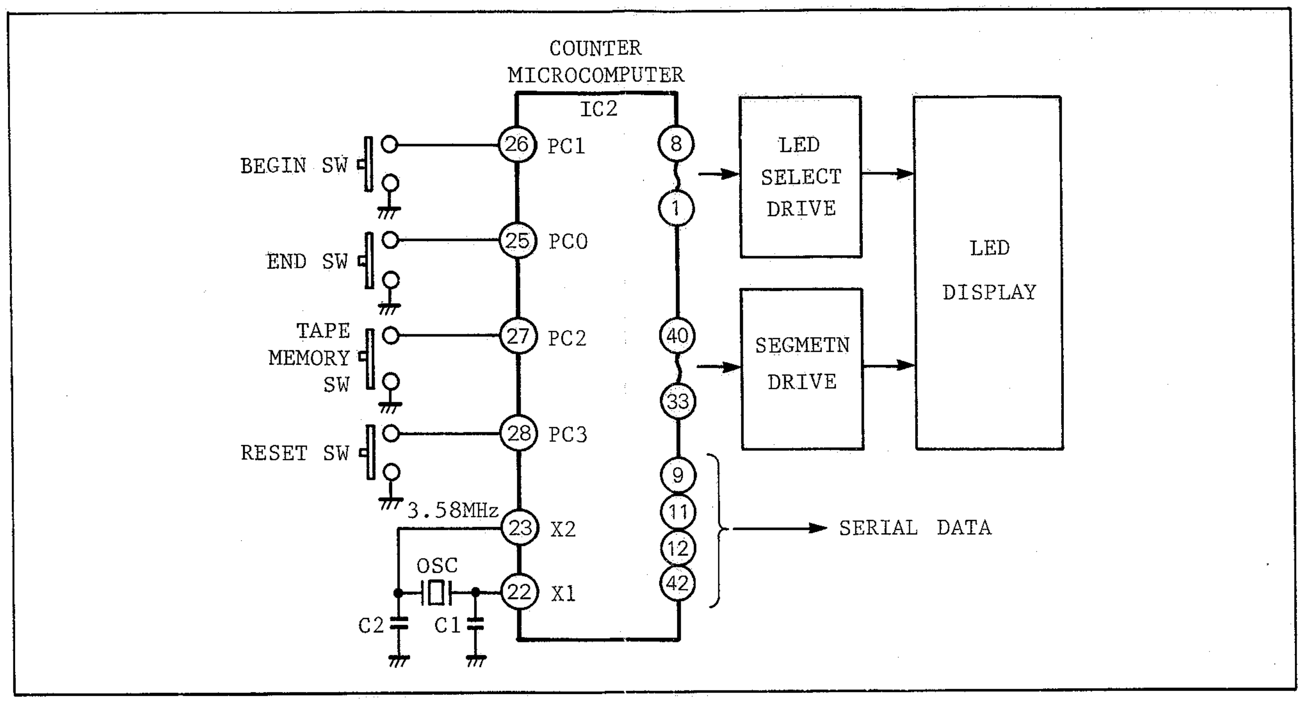

COUNTER MICROCOMPUTER
IC2
BEGIN SW
END SW
TAPE MEMORY SW
RESET SW
26 PC1
25 PC0
27 PC2
28 PC3
3.58MHz
23 X2
OSC
22 X1
C2
C1
8
1
40
33
9
11
12
42
LED SELECT DRIVE
SEGMETN DRIVE
LED DISPLAY
SERIAL DATA

Figure 2-53. Auto Repeat Circuit

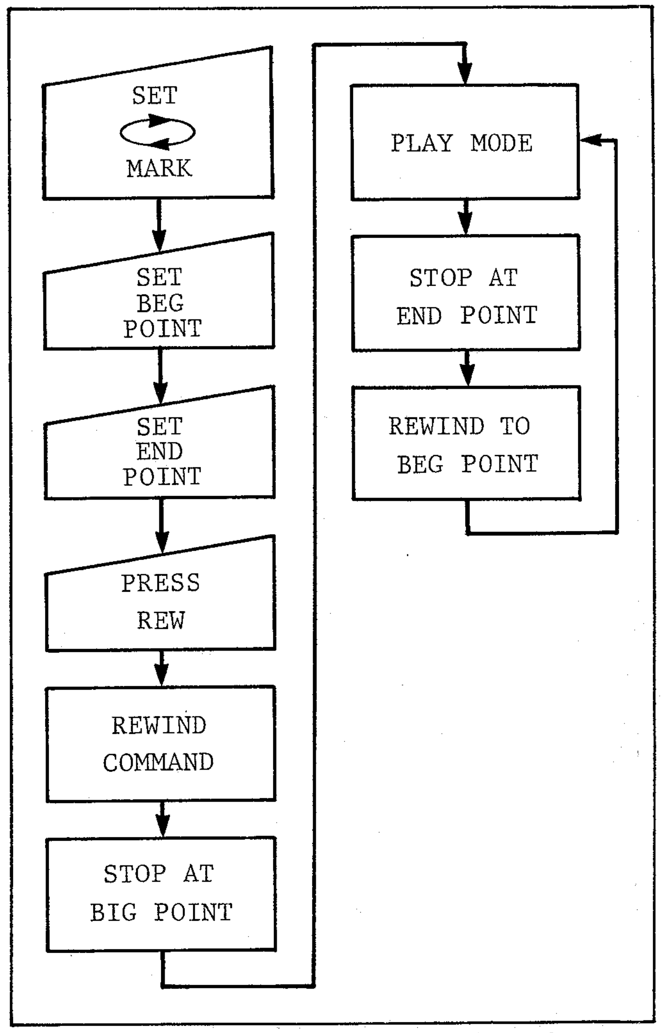

SET
MARK
SET BEG POINT
SET END POINT
PRESS REW
REWIND COMMAND
STOP AT BIG POINT
PLAY MODE
STOP AT END POINT
REWIND TO BEG POINT

Figure 2-55. Auto Repeat Flow Chart.

(b) Auto Repeat

This function will repeatedly playback any desired portion of the tape. To enter this mode, the Tape Memory switch is pressed until the ⇄ mark appears on the display. Then, the short and end points are entered by pressing the BEG and END buttons when the tape is at the desired points. This results in auto play and auto rewind commands through the serial data line to the other microcomputer.
The sequence of events for this mode is given in the flow chart of Figure 2-55 which also gives the modified sequence for the One-Time Repeat function described below.

(c) One-Time Repeat Function

This is similar to the Auto Repeat function except that the unit will play the desired section of tape only once each time the play button is pressed. To enter this mode, the Tape Memory Switch is pressed until the mark ↺ appears on the display. Start and End points are then entered in the same way as for Auto Repeat function. (Refer to flow chart of Figure 2-56.)

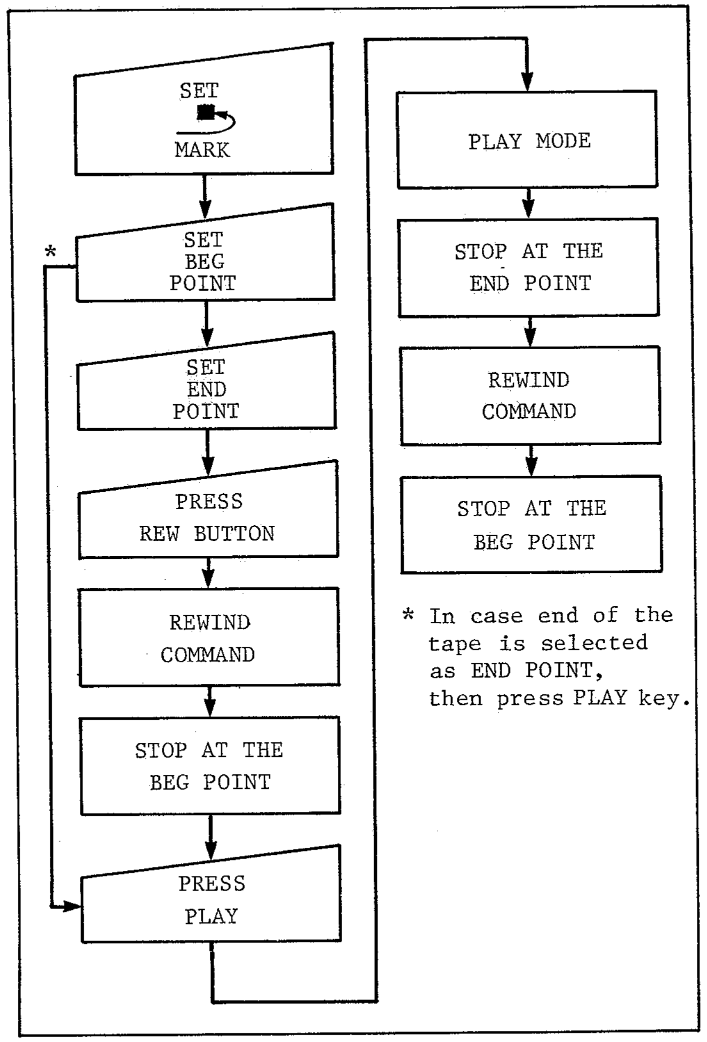

SET
MARK
*
SET BEG POINT
SET END POINT
PRESS REW BUTTON
REWIND COMMAND
STOP AT THE BEG POINT
PRESS PLAY
PLAY MODE
STOP AT THE END POINT
REWIND COMMAND
STOP AT THE BEG POINT
* In case end of the tape is selected as END POINT, then press PLAY key.

Figure 2-56. One Time Auto Repeat Flow Chart.

3-7. CASSETTE IN MODE

When the cassette is inserted in the unit the counter will display the Cassette-In mark ⊙⊙ Figure 2-57 shows the circuits associated with this indicator.
When the cassette is inserted and down, the Cassette Down switch is ON, (connected to ground) and the Cassette Up switch is OFF.
These signals are detected by the System Control Microcomputer IC3, and sent to the Counter Microcomputer IC2 through the serial data line. IC2 then outputs the LED signals to display the Cassette-In mark in all modes except eject mode.

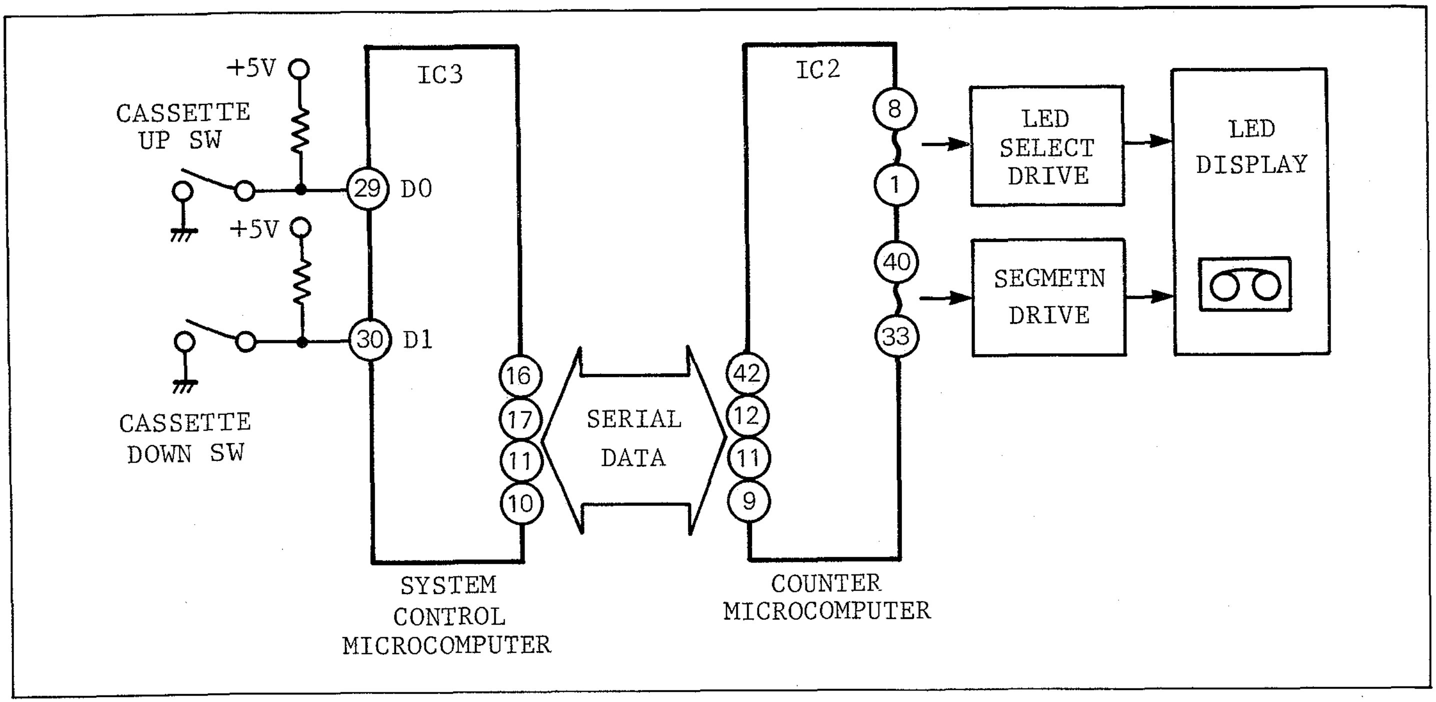

+5V
CASSETTE
UP SW
+5V
CASSETTE
DOWN SW
IC3
29
D0
30
D1
16
17
11
10
SYSTEM
CONTROL
MICROCOMPUTER
SERIAL
DATA
IC2
8
1
40
33
42
12
11
9
COUNTER
MICROCOMPUTER
LED
SELECT
DRIVE
SEGMETN
DRIVE
LED
DISPLAY

Figure 2-57. Cassette-in Circuit.

Filament Circuit

Filament Circuit is made of an oscillation circuit comprising transformer T1, transistor Q14, R23 and C8. Output from T1 is fed to filaments. The -30V inverter power source driving the Counter circuit is generated by T1, D2, D3, and C10. Transistors Q15 and Q16 respectively stop the oscillation circuit during reset. See Figure 2-58.

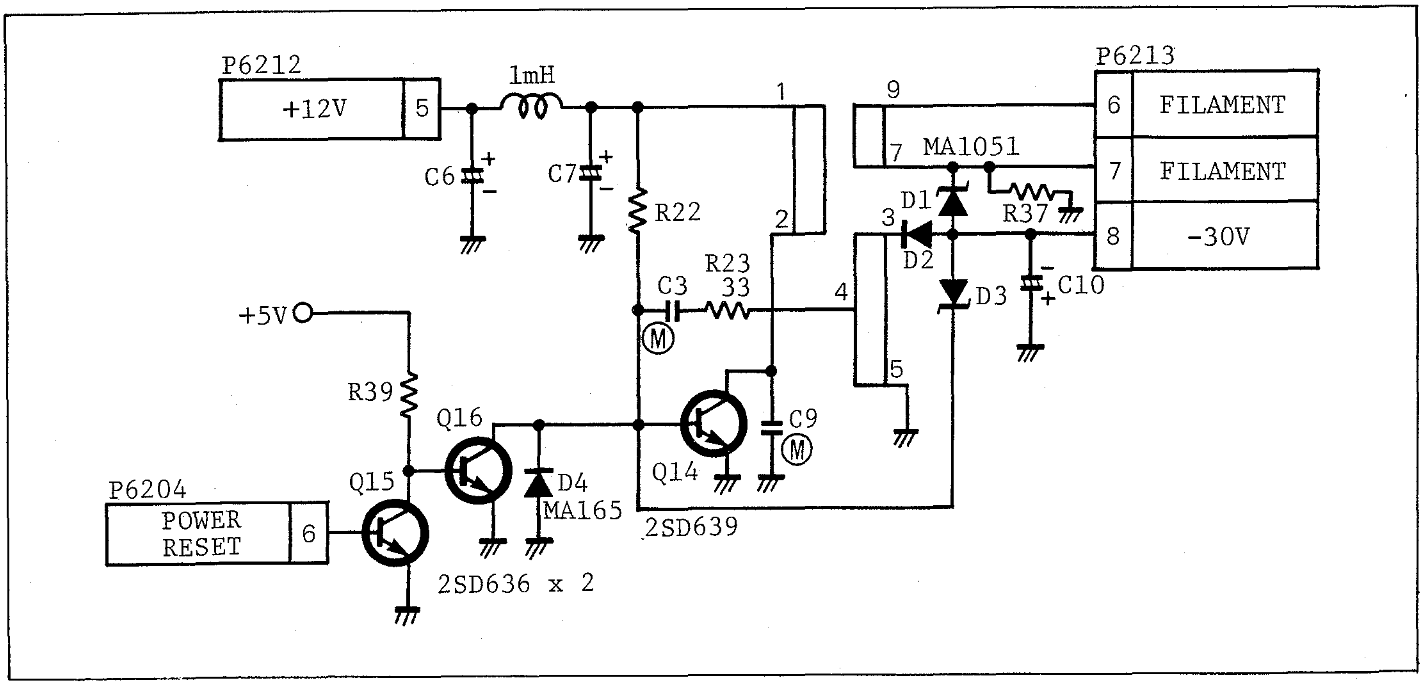

P6212
+12V
5
1mH
C6
C7
R22
R23
33
C3
M
+5V
R39
Q16
Q15
D4
MA165
Q14
2SD639
C9
M
2SD636 x 2
P6204
POWER
RESET
6
1
2
4
5
9
7
3
MA1051
D1
D2
D3
R37
C10
P6213
6
FILAMENT
7
FILAMENT
8
-30V

Figure 2-58. Filament Circuit.

4. 34-pin Control Microcomputer Circuit

General Description

The AG-6800 can be combined in a system with a Remote. Controller AG-A600, NV-A810.

The 34 pin Data Modulation Microcomputer circuit provides the serial to parallel and parallel to serial data conversion required for the above controllers.

PIN NO.	NAME	I/O	Function	ACTIVE
1	PG0	OUT	Cassette Tape Inserted	Ⓗ
2	PG1	OUT	Serial Data Inhibit Signal	———
3	PG2	OUT	Scan Pulse	See Figure 2-60
4	PG3	OUT		
5	PH0	OUT		
6	PH1	OUT		
7	PH2	OUT		
8	PH3	OUT		
9	S1	IN	Serial Information Signal	———
10	SO	OUT	Serial Information Signal	———
11	$\overline{\text{SCK}}$	IN	Serial Clock Signal	———
12	PA0	IN	Address Information Signal	———
13	PA1	IN	Switch Scan Pulse	See Figure 2-61
14	PA2	IN	Remote REC SW Depressed	Ⓛ
15	PA3	IN	Remote PLAY SW Depressed	Ⓛ
16	PB0	IN	Remote FF SW Depressed	Ⓛ
17	PB1	IN	Remote REW SW Depressed	Ⓛ
18	PB2	IN	Remote STOP SW Depressed	Ⓛ
19	PB3	IN	Remote AUDIO DUB SW Depressed	Ⓛ
20	TEST	GND	Not Used	GND
21	GND	GND	GND	GND
22	X1	IN	Microcomputer Clock Signal	3.58MHz
23	X2	IN		
24	$\overline{\text{RES}}$	IN	Reset Signal	Ⓛ
25	PC0	IN	Remote Search Knob Rotated	See Figure 2-65
26	PC1	IN		
28	PC3	IN		
29	PD0	IN		
27	PC2	IN	PH Scan Pulse	See Figure 2-61
30	PD1	IN	Remote Step SW Depressed	Ⓛ
31	PD2	OUT	FF/REW Mode	Ⓛ
32	PD3	OUT	PAUSE SW Depressed	Ⓛ
33	PE0	OUT	PAUSE Mode	Ⓗ
34	PE1	OUT	AUDIO DUB Mode	Ⓗ
35	PE2	OUT	REW Mode	Ⓗ
36	PE3	OUT	FF Mode	Ⓗ
37	PF0	OUT	PLAY Mode	Ⓗ
38	PF1	OUT	REC Mode	Ⓗ
39	PF2	OUT	Start Mark	Ⓛ
40	PF3	OUT	REVERSE Mode	Ⓗ
41	VCC	IN	+5V	+5V
42	$\overline{\text{INT}}$	IN	External Interrupt Request Signal	———

Figure 2-59. 34-pin Control Microcomputer I/O Table

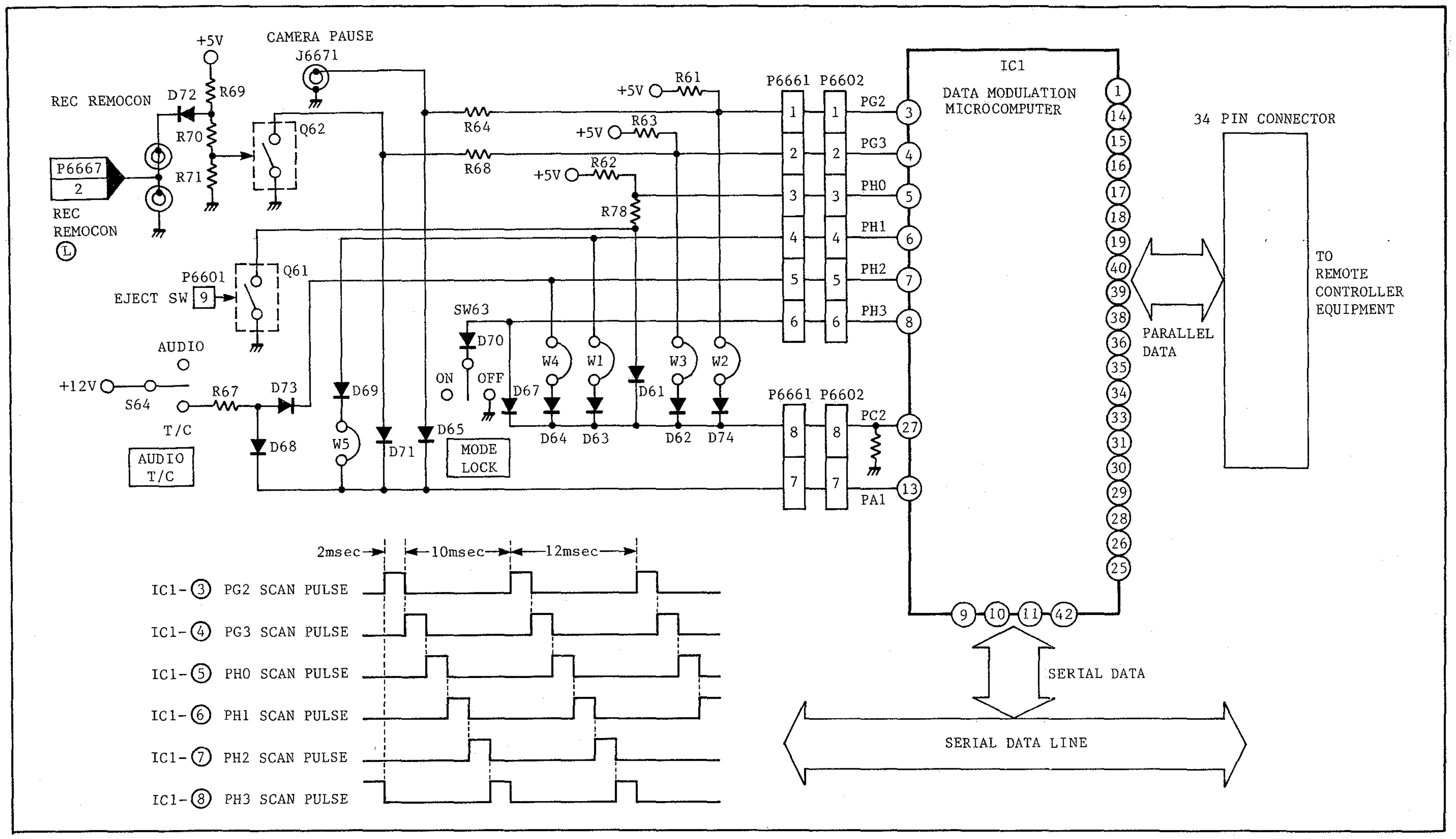

+5V
CAMERA PAUSE
J6671
REC REMOCON
D72
R69
R70
Q62
R71
P6667
2
REC
REMOCON
Ⓛ
P6601
Q61
EJECT SW
9
AUDIO
+12V
S64
R67
D73
T/C
AUDIO
T/C
D68
D69
W5
D71
D65
ON
OFF
MODE
LOCK
SW63
D70
D67
+5V
R61
R64
R68
+5V
R63
+5V
R62
R78
W4
W1
W3
W2
D61
D64
D63
D62
D74
P6661
P6602
PG2
PG3
PH0
PH1
PH2
PH3
PC2
PA1
IC1
DATA MODULATION
MICROCOMPUTER
34 PIN CONNECTOR
TO
REMOTE
CONTROLLER
EQUIPMENT
PARALLEL
DATA
SERIAL DATA
SERIAL DATA LINE
2msec
10msec
12msec
IC1-③ PG2 SCAN PULSE
IC1-④ PG3 SCAN PULSE
IC1-⑤ PH0 SCAN PULSE
IC1-⑥ PH1 SCAN PULSE
IC1-⑦ PH2 SCAN PULSE
IC1-⑧ PH3 SCAN PULSE

Figure 2-60. 34 Pin Data Modulation Microcomputer Circuit

In addition, Mode Lock switch and Audio CH2 switch on AG-6800 are applied scan pulses from the Data Modulation Microcomputer IC1, and selected switch signals are sent back to the System Microcomputer through the serial data link.
A simplified block diagram of the Data Modulation Microcomputer circuit is shown in Figure 2-60.

Detailed Description

4-1. SWITCH MATRIX CIRCUIT

Figure 2-60 shows the interconnections for the Switch Matrix Circuit. Scan pulses of 12msec are supplied from the microcomputer ports PG2 (pin 3), PG3 (pin 4), PH0 (pin 5), PH1 (pin 6), PH2 (pin 7) and PH3 (pin 8) to the switch matrix circuit on the near panel through the connector P6601.
For example, when the MODE LOCK switch SW63 is ON, PH3 scan pulse passes through the diode D67 and is fed back to pin 27 (PC2) of the microcomputer IC1. The microcomputer recognizes that the MODE LOCK switch is ON, and generates the serial output code to perform mode lock.

SWITCH AND JUMPER	FUNCTION	SCAN PULSE AND PIN NO.					
		Pin ③	Pin ④	Pin ⑤	Pin ⑥	Pin ⑦	Pin ⑧
		PG2	PG3	PH0	PH1	PH2	PH3
MODE LOCK SW SW 63 "ON"	Inhibits any function buttons.						Pin ㉗ PC 2
TIME CODE/AUDIO SW SW 64 "T/C"	When using the Time Code signal on the Audio track CH2.					Pin ⑬ PA 1	
TIME CODE/AUDIO SW SW 64 "AUDIO"	When using the Audio signal on the Audio track CH2.					╲	
AUTO REW JUMPER W4 "CONNECT"	The unit will rewind when the tape end is detected.					Pin ㉗ PC 2	
AUTO REW JUMPER W4 "REMOVE"	The unit will stop when the tape end is detected.					╲	
DIRECT SEARCH JUMPER W5 "CONNECT"	The unit will rewind the tape to the beginning when the tape end is detected.				Pin ⑬ PA 1		
DIRECT SEARCH JUMPER W5 "REMOVE"	The unit will stop when the tape end is detected.				╲		
ON/OFF REC REMOTE SW "ON"	The unit will perform the REC PLAY mode.		Pin ⑬ PA 1				
ON/OFF REC REMOTE SW "OFF"	The following functions are possible with this switch, which on to OFF transition during the REC PLAY mode.		╲				
REC REMOTE JUMPERS W2 "REMOVE" W3 "REMOVE"	The unit is stopped on the PAUSE mode.	╲	╲				
REC REMOTE JUMPERS W2 "CONNECT" W3 "REMOVE"	The unit is stopped and cassette tape is ejected.	Pin ㉗ PC 2	╲				
REC REMOTE JUMPERS W2 "REMOVE" W3 "CONNECT"	The unit will rewind the tape to the beginning and the tape will eject.	╲	Pin ㉗ PC 2				
REC REMOTE JUMPERS W2 "CONNECT" W3 "CONNECT"	The unit is stopped.	Pin ㉗ PC 2	Pin ㉗ PC 2				
DIRECT REW JUMPER W1 "CONNECT"	The unit will subload the tape when the cassette tape is inserted.				Pin ㉗ PC 2		
DIRECT REW JUMPER W1 "REMOVE"	The unit will rewind the tape to the beginning when the cassette tape is inserted.				╲		

Figure 2-61. Switch Matrix Circuit.

In order to extend the user's applications, the functions of the program can be achieved by connecting or disconnecting the Jumper W1, W2, W3, W4 and W5. The function table is shown in Figure 2-61.

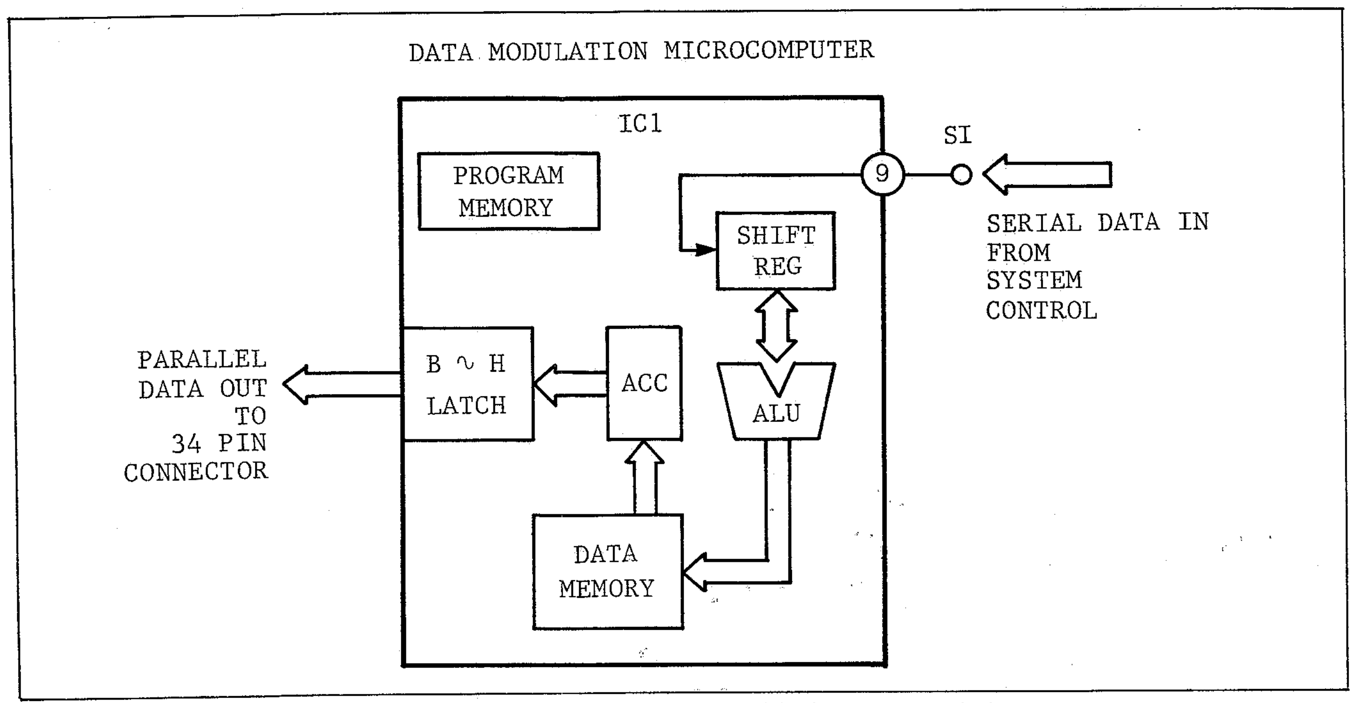

DATA MODULATION MICROCOMPUTER
IC1
PROGRAM MEMORY
9
SI
SHIFT REG
SERIAL DATA IN FROM SYSTEM CONTROL
PARALLEL DATA OUT TO 34 PIN CONNECTOR
B ∿ H LATCH
ACC
ALU
DATA MEMORY

Figure 2-62. Serial to Parallel Data Modulation

4-2. SERIAL TO PARALLEL DATA MODULATION

Serial data from the system control is applied at IC1 pin 9 to a shift register. The serial data is processed into parallel data by the ALU, Data Memory, and Accumulator, and then sent to the controller connected to the 34 pin connector.

4-3. PARALLEL TO SERIAL DATA MODULATION

Parallel Data from external controller inputs at IC1 pins 12-19 and pins 25-32 are converted to serial data for the system control. Figure 2-63 shows the data flow for the example of an AG-6800 combined in a system with a remote Controller AG-A600.
When the play button is pressed at the Remote Controller, the play Low signal witch is the active bit of the parallel play code is applied to the Latch pin 15. The parallel data is then processed into serial data for the play mode and sent to the microcomputer in the system control.

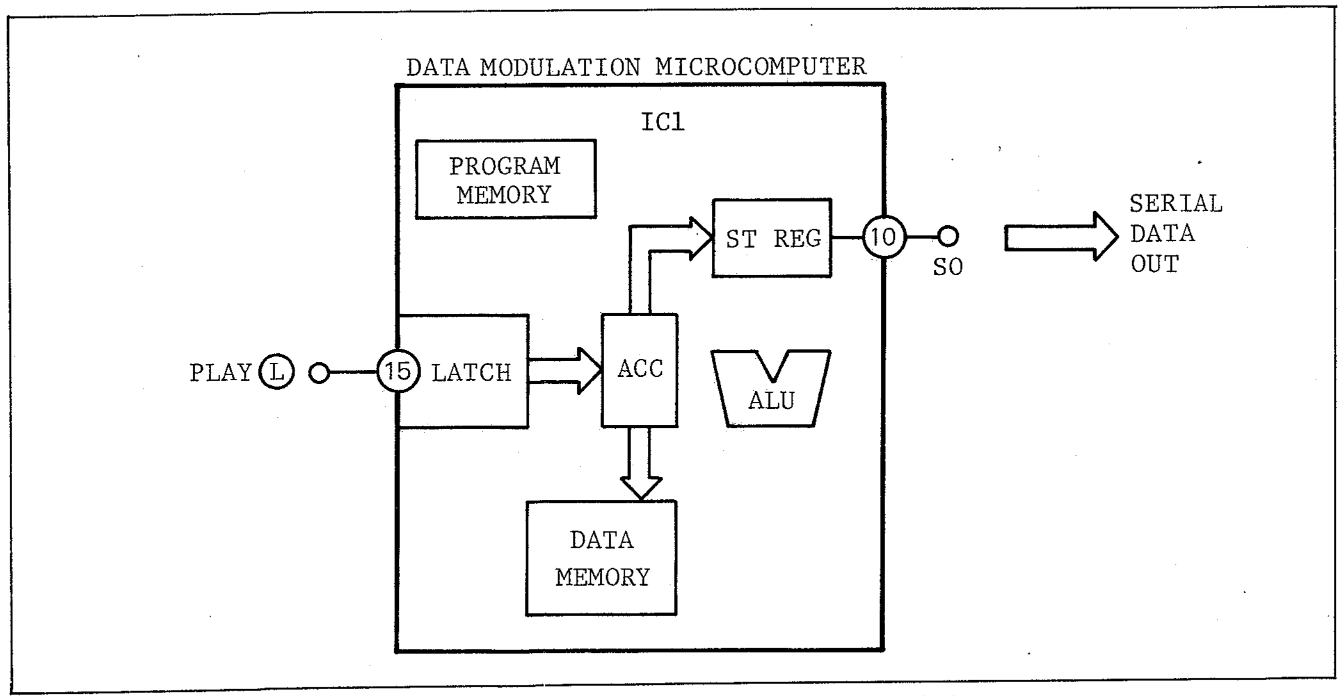

DATA MODULATION MICROCOMPUTER
IC1
PROGRAM MEMORY
ST REG
10
SO
SERIAL DATA OUT
PLAY Ⓛ
15
LATCH
ACC
ALU
DATA MEMORY

Figure 2-63. Parallel to Serial Data Modulation

4-4. REMOTE SEARCH CONTROL

The remote search dial generates a digital word which indicates a request for a different speed to VTR through the 34 pin connector and 34 oin control microcomputer. See Figure 2-64.
The digital words are related to the pins as shown in the table of Figure 2-65.

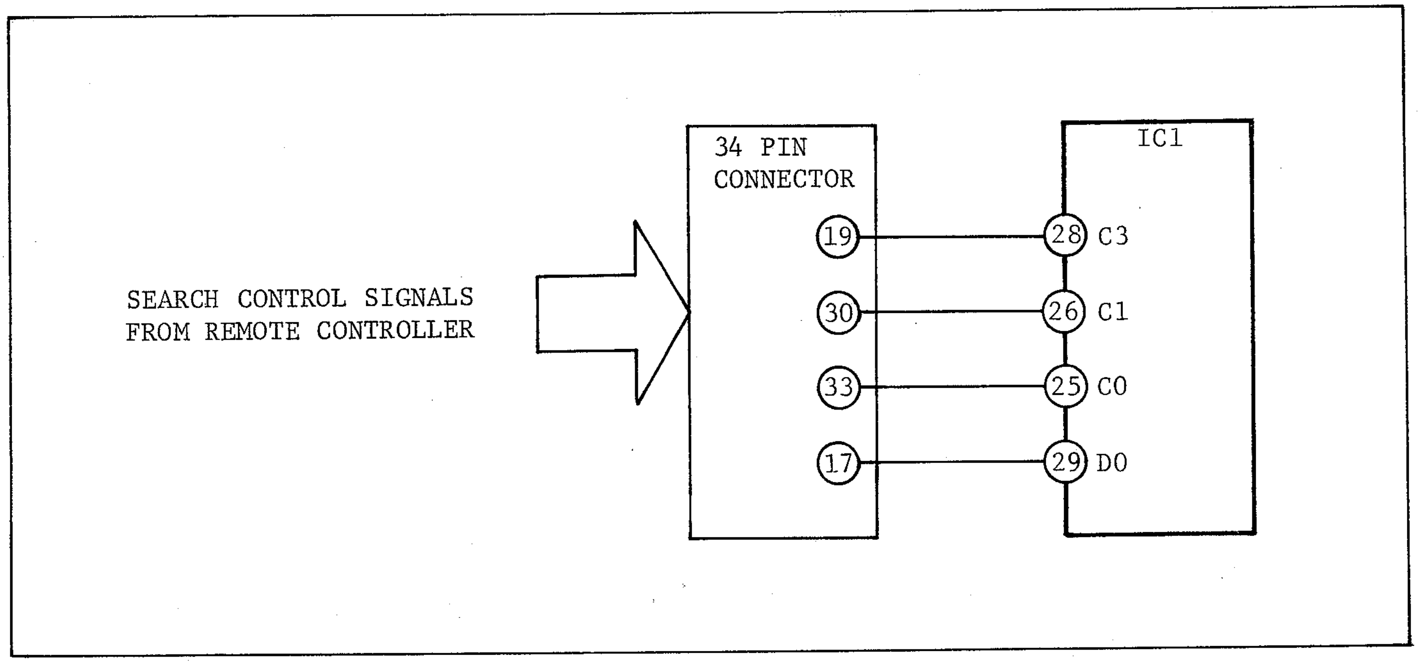

SEARCH CONTROL SIGNALS FROM REMOTE CONTROLLER
34 PIN CONNECTOR
19
30
33
17
IC1
28
C3
26
C1
25
C0
29
D0

Figure 2-64. Remote Search COntrol.

SIGNAL	MODE / PIN NO. (IC1)	REVERSE					FORWARD							
		x10	x6	x2	x1	x1/2	x1/25	x1/10	x1/5	x1/2	x1	x2	x6	x10
REMOTE ⑲	28	0	1	0	1	0	1	0	1	0	1	0	1	0
REMOTE ㉚	26	1	1	1	1	0	0	0	0	0	1	1	1	1
REMOTE ㉝	25	0	0	1	1	1	0	0	1	1	1	1	0	0
REVERSE Ⓛ ⑰	29	0	0	0	0	0	1	1	1	1	1	1	1	1

NOTE: "1" means "High Ⓗ " status.
"0" means "Low Ⓛ " status.

Figure 2-65. Remote Search Control Signals.

CYLINDER & CAPSTAN SERVO CIRCUIT

General Description

The recorder is a mechanical device or machine whose ability to move the tape by means of a capstan must be precise, and whose rotating video heads must be synchronized with the information they are supposed to record. The capstan and video head cylinder motors are constantly being monitored and any deviation is corrected. This action is called Servo action and is necessary in video recording and playback.

If there were no servo action, information would be stored on the tape in some random or arbitrary fashion, which would produce uneven information recovery during playback. This would result in unusable playback. The servo circuit must control the speeds of the motors so that the information is put on the tape in a specific pattern, and this pattern can then be followed during playback.

It is worthwhile to mention here that the servo circuit puts a reference signal or "control signal" on the tape during the record mode to enable the recording pattern to be traced during playback.

A "Control Track" space is reserved on the tape for this purpose.

CYLINDER SERVO BASICS-
RECORD AND PLAYBACK

In order to place the video tracks on the tape in a specific pattern, the video heads have to be locked to the incoming video signal. Thus it is necessary to have the head cylinder motor servo-controlled. The video tracks are shown in Figure 3-1.

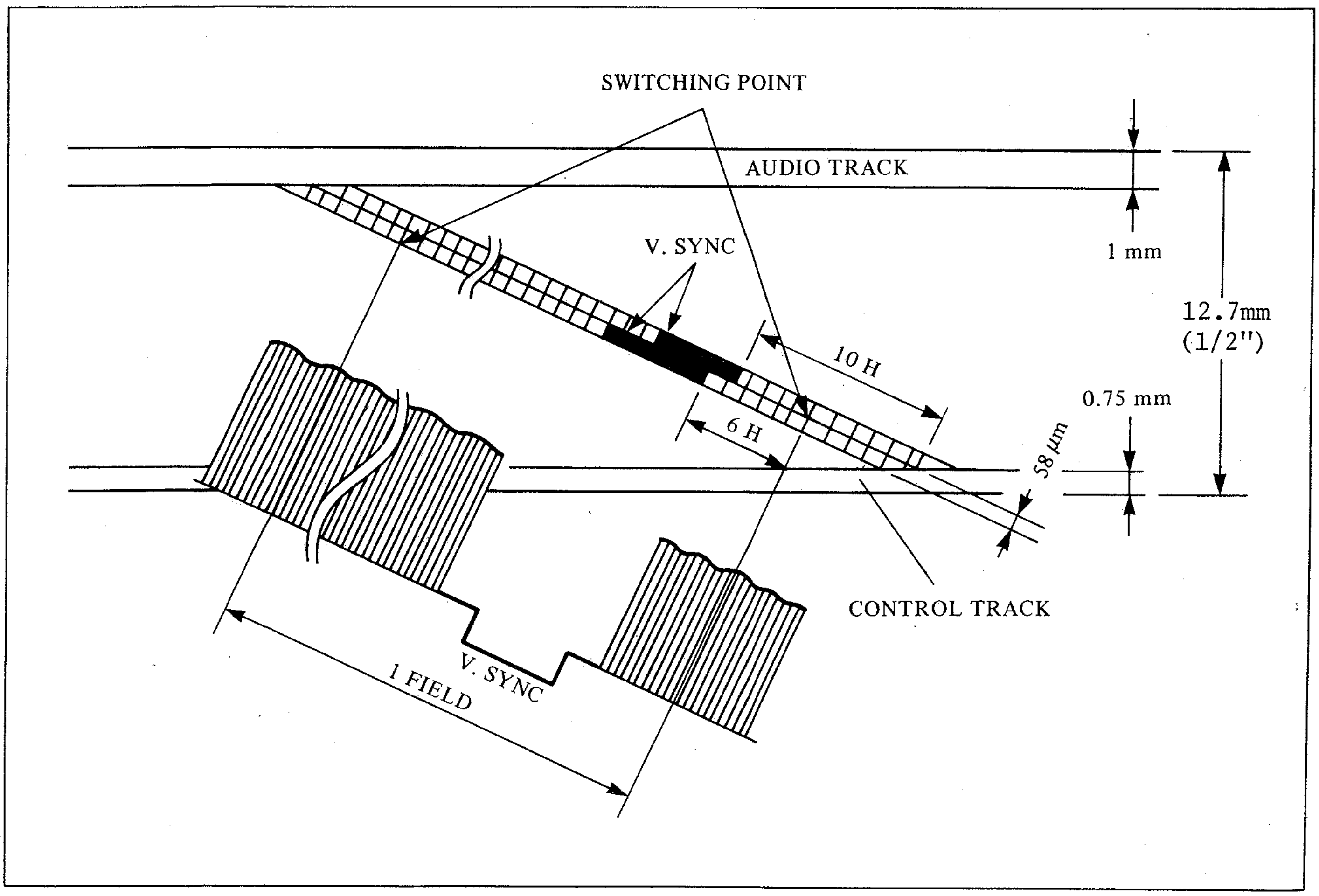


Figure 3-1. SP Mode Tape Format.

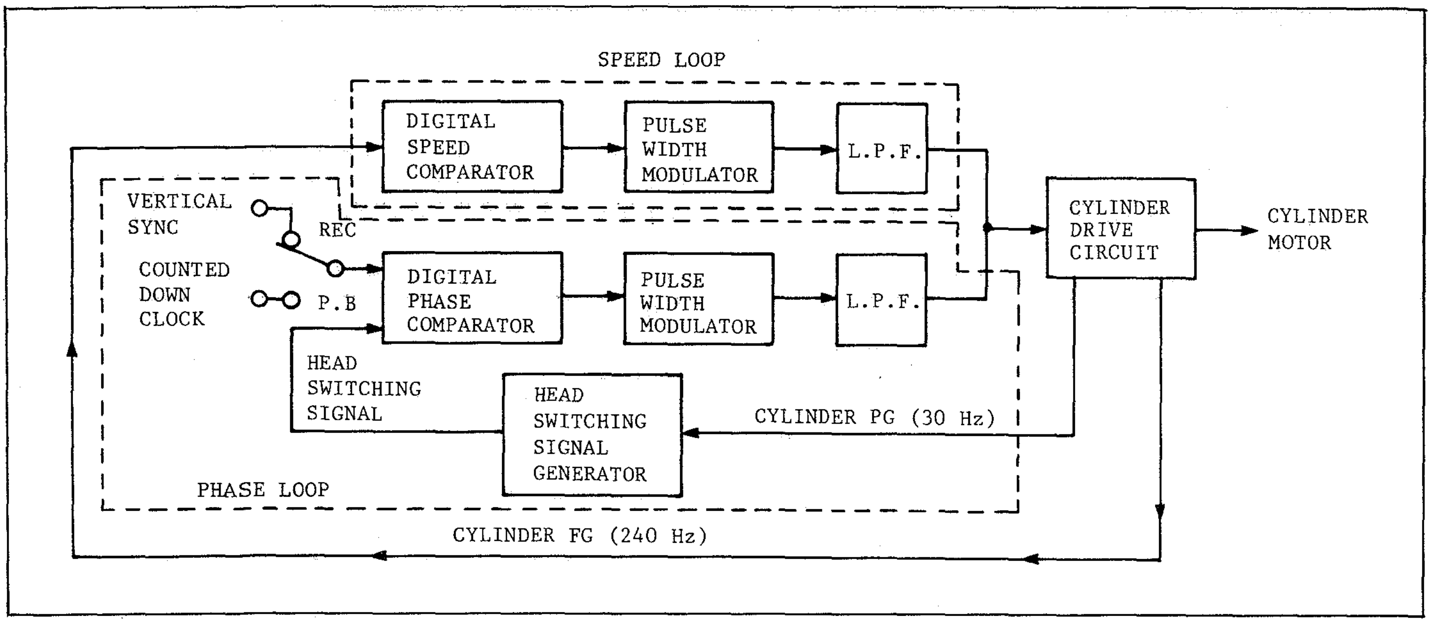

SPEED LOOP
DIGITAL SPEED COMPARATOR
PULSE WIDTH MODULATOR
L.P.F.
VERTICAL SYNC
REC
COUNTED DOWN CLOCK
P.B
DIGITAL PHASE COMPARATOR
PULSE WIDTH MODULATOR
L.P.F.
CYLINDER DRIVE CIRCUIT
CYLINDER MOTOR
HEAD SWITCHING SIGNAL
HEAD SWITCHING SIGNAL GENERATOR
CYLINDER PG (30 Hz)
PHASE LOOP
CYLINDER FG (240 Hz)

Figure 3-2. Cylinder Servo Basic Block Diagram.

Servo action assures that vertical sync occurs approximately 10H (H: horizontal line) from the beginning of the track. Since vertical sync is to be placed at the same spot on every track, it would seem logical to lock the servo to vertical sync. The Cylinder Servo System does this with two control sections, a Speed Control Loop and a Phase Control Loop (Figure 3-2). The Cylinder Speed Control maintains the Cylinder Speed close to 1800RPM at all times. This figure comes from the fact that the vertical rate of a color video signal is 59.94Hz, and since there are two heads (used for recording and normal playback) in the cylinder, it must spin at 59.94/2Hz or 1,798RPM.

The other control section, the Cylinder Phase Control is used to make sure that vertical sync is recorded about 10H into the video track.

Each control section is briefly described below, and described in more detail in the Detailed Description Section.

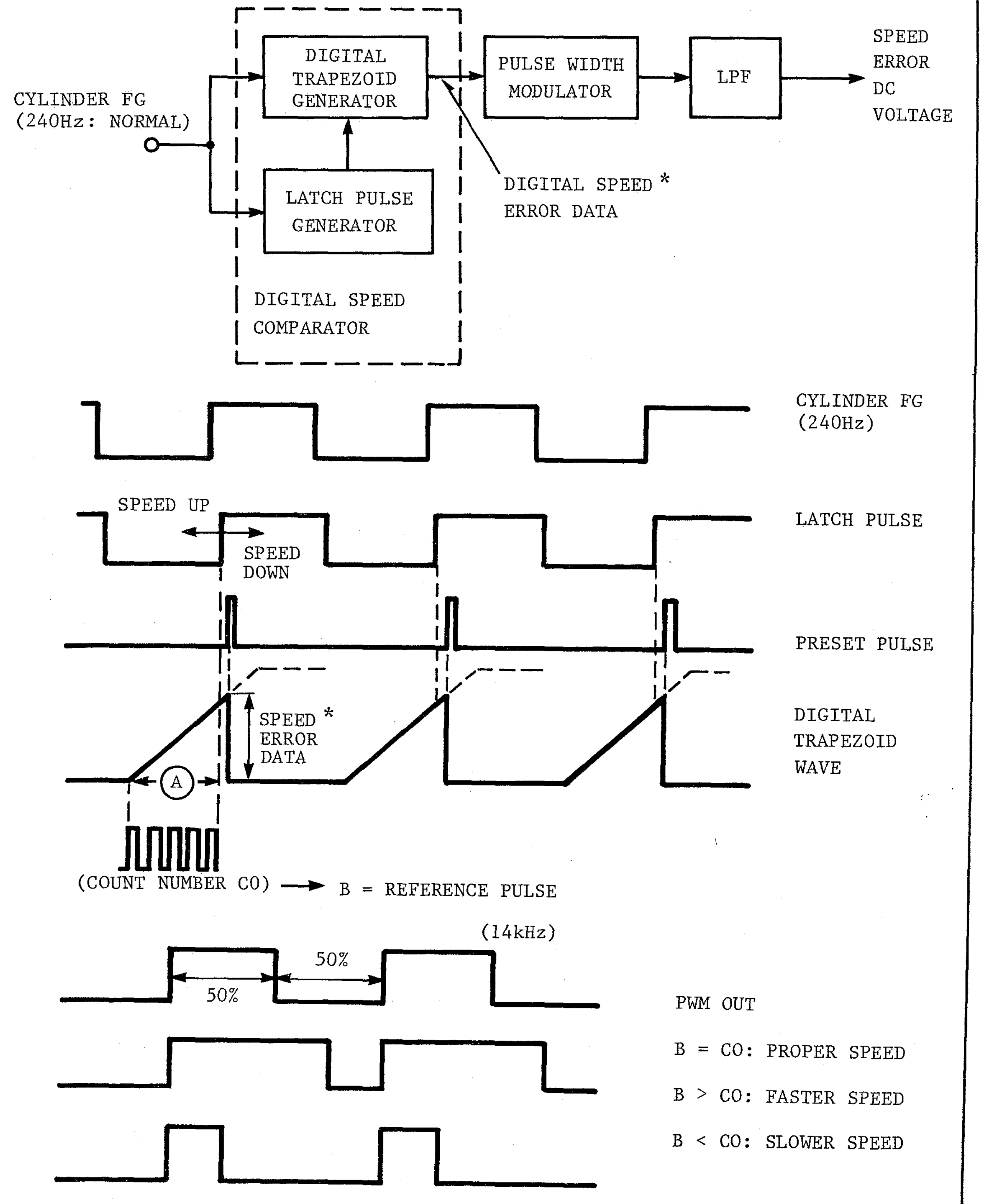
CYLINDER SPEED CONTROL

To achieve speed control, the servo circuit uses a Digital Speed Comparator. The Cylinder Motor Drive circuit (described in the Detailed Description section) delivers a sinewave signal whose frequency is determined by the cylinder speed. The sinewave signal is converted into a square wave called the Cylinder FG signal and is applied to the Digital Speed Comparator. (Figure 3-3.)

The Cylinder FG signal is used to develop a Speed Error DC voltage by the Digital Speed Comparator, the PWM (Pulse Width Modulator) circuit, and the Low Pass Filter.

Frequency variations in the Cylinder FG signals are converted to a variable pulse width signal at the output of the PWM circuit (Figure 3-4), and then applied to the Low Pass Filter. Filtering the PWM output will yield a DC voltage, which in turn, is used to control the speed of the cylinder motor.

In the normal condition, with the cylinder running at the correct speed, a 50% duty square wave is applied to the Low Pass Filter which results in the normal DC motor drive voltage of 2.5 Volts. If the cylinder motor speed varies, the PWM output and the output DC voltage are changed as shown in Figure 3-4.


CYLINDER FG
(240Hz: NORMAL)
DIGITAL TRAPEZOID GENERATOR
LATCH PULSE GENERATOR
DIGITAL SPEED COMPARATOR
PULSE WIDTH MODULATOR
LPF
SPEED ERROR DC VOLTAGE
DIGITAL SPEED *
ERROR DATA
CYLINDER FG
(240Hz)
SPEED UP
SPEED DOWN
LATCH PULSE
PRESET PULSE
SPEED *
ERROR DATA
DIGITAL TRAPEZOID WAVE
A
(COUNT NUMBER CO)
B = REFERENCE PULSE
(14kHz)
50%
50%
PWM OUT
B = CO: PROPER SPEED
B > CO: FASTER SPEED
B < CO: SLOWER SPEED

* Actually, the speed error data is applied to the PWM circuit as 8 bit digital data.
The numerical value of the data will depends upon the FG frequency.

Figure 3-3. Cylinder Speed Servo.

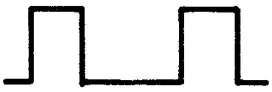
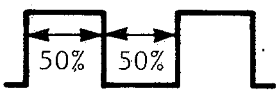
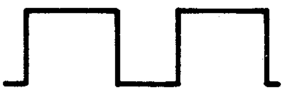
CYLINDER MOTOR SPEED	SLOWER ROTATION	PROPER ROTATION	FASTER ROTATION
The PWM CIRCUIT OUTPUT	 The high Period becomes shorter.	 50% duty	 The high Period becomes longer.
OUTPUT DC VOLTAGE	The voltage decreases.	Center Voltage (approx. 2.5V)	The Voltage increases.

Figure 3-4. PWM Output and Output DC Voltage.

CYLINDER PHASE CONTROL

To lock the phase of the cylinder motor to the incoming vertical sync during the Record mode, a phase control is necessary. We need to know the internal construction of the cylinder motor to understand the phase servo control system (Figure 3-5). The PG pulses produced by the motor will be used for the phase control. As the cylinder spins, the flywheel also spins. There are 2 magnets on the flywheel; one seated N-S, the other seated S-N and have a set position with respect to the video heads. As they pass over the stationary coil, positive going and negative going (bipolar) pulses are produced (Figure 3-6). These pulses indicate the position of the upper cylinder, and are called the PG pulse.

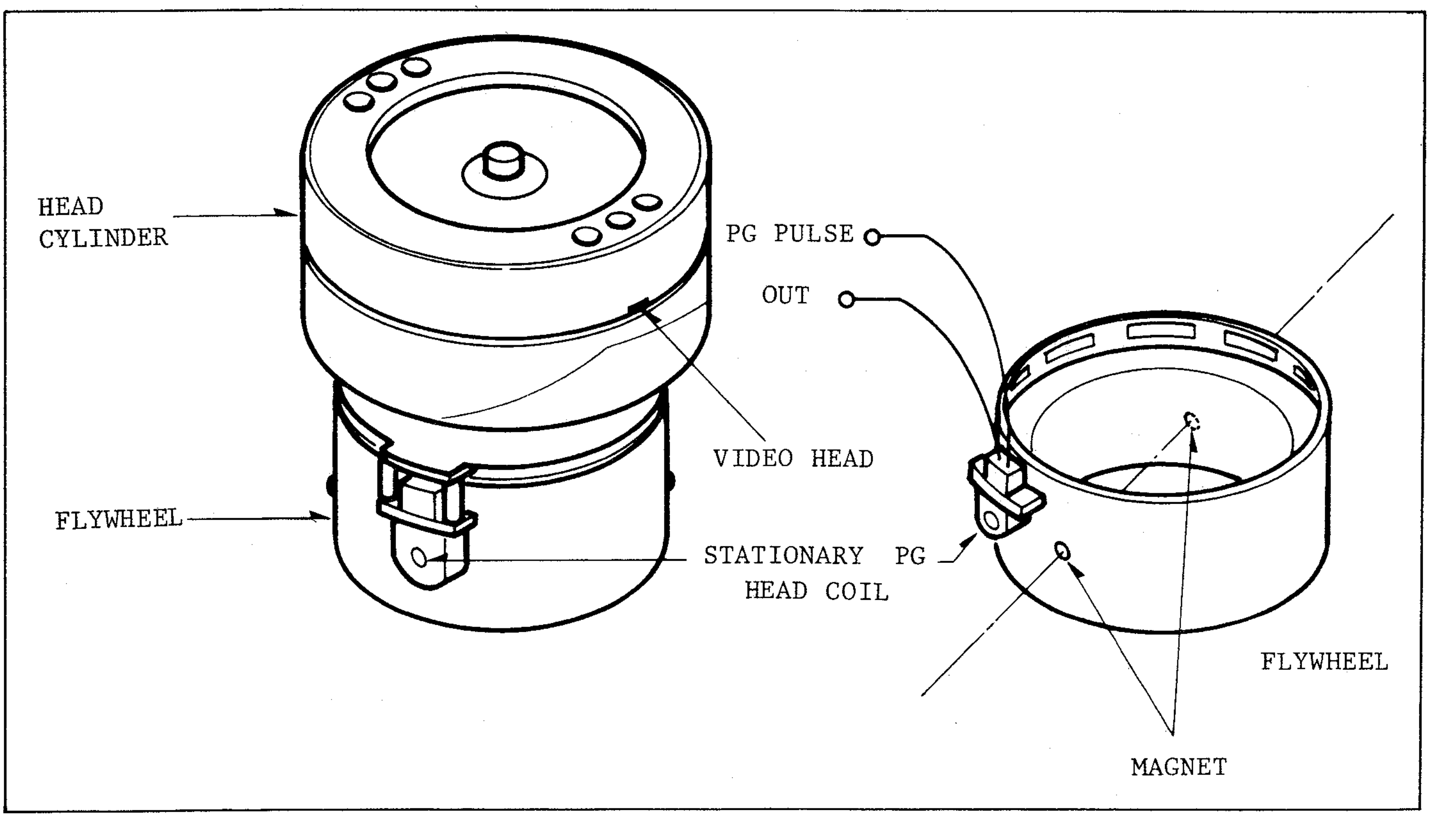


Figure 3-5. Head Cylinder Motor.

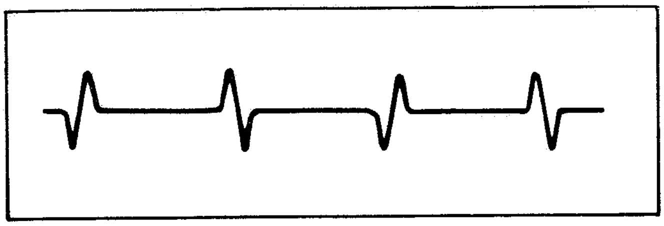


Figure 3-6. Bipolar PG Pulses.

Next, the PG pulses are separated, and each set of pulses is used to trigger a MMV (Monostable Multi-Vibrator). The MMV outputs are then supplied to the FF (Flip Flop) inside IC2003 as shown in Figure 3-7.

Because of the arrangement, we know that whenever the output square wave goes low, the A head is starting its sweep, and when the output square wave goes high, the B head is starting its sweep. The square wave output (FF output) is used as the head switching signal, and is also used for phase control.

For head switching, when the square wave goes high, the "A" playback channel is turned OFF. When the square wave goes low, the "B" playback channel is turned OFF. This is done to prevent any possible noise from the unused video head.

The second use of the Head Switching square wave is for phase control.

The head switching signal is applied to the cylinder phase comparator as the variable signal (refer to Figure 3-8).

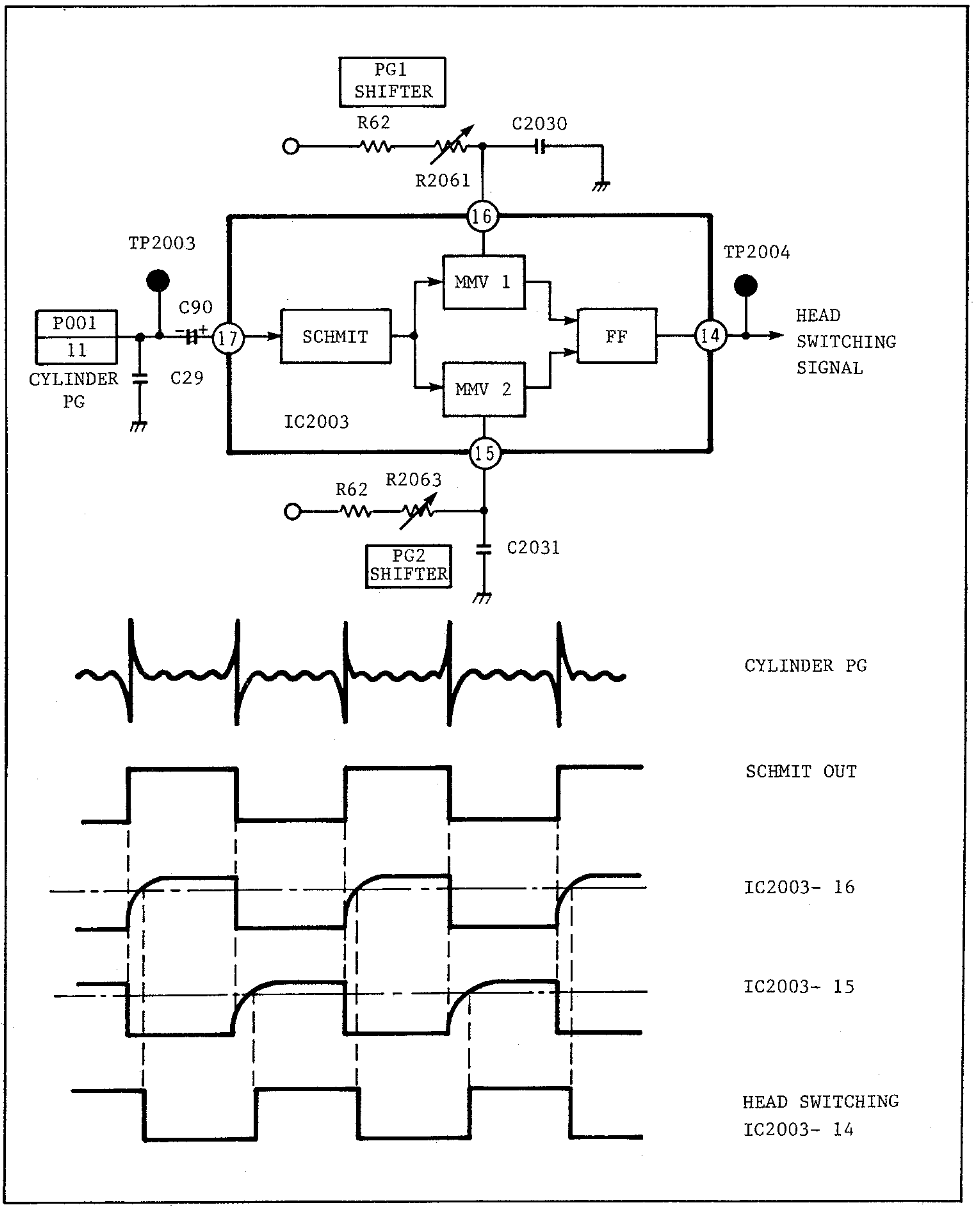
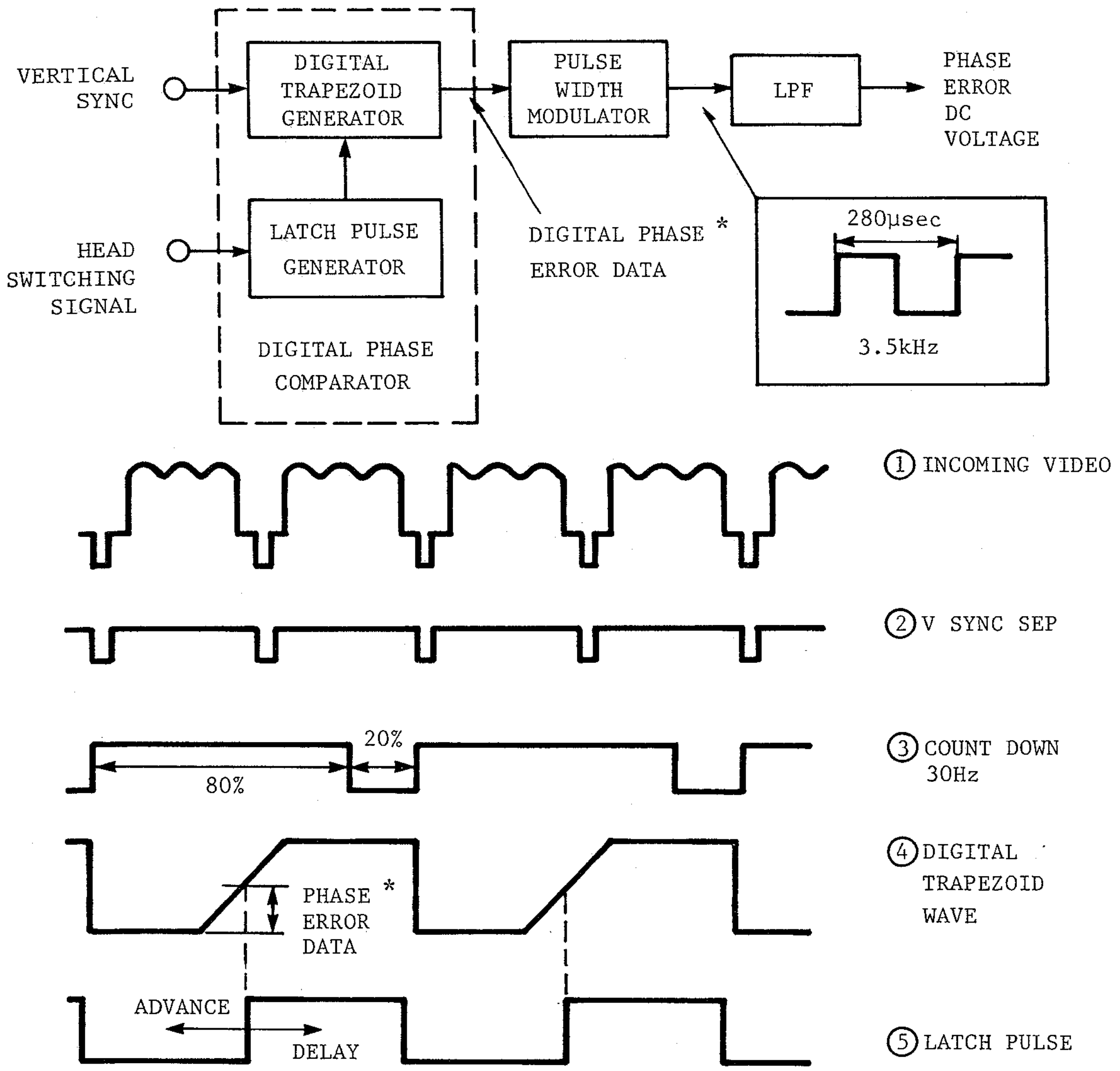

PG1
SHIFTER
R62
C2030
R2061
16
TP2003
TP2004
MMV 1
C90
P001
11
CYLINDER
PG
17
SCHMIT
FF
14
HEAD
SWITCHING
SIGNAL
C29
MMV 2
IC2003
15
R62
R2063
C2031
PG2
SHIFTER
CYLINDER PG
SCHMIT OUT
IC2003- 16
IC2003- 15
HEAD SWITCHING
IC2003- 14

Figure 3-7. Head Switching Pulse Generator.


VERTICAL SYNC
HEAD SWITCHING SIGNAL
DIGITAL TRAPEZOID GENERATOR
LATCH PULSE GENERATOR
DIGITAL PHASE COMPARATOR
PULSE WIDTH MODULATOR
LPF
PHASE ERROR DC VOLTAGE
DIGITAL PHASE ERROR DATA *
280μsec
3.5kHz
① INCOMING VIDEO
② V SYNC SEP
80%
20%
③ COUNT DOWN 30Hz
PHASE ERROR DATA *
④ DIGITAL TRAPEZOID WAVE
ADVANCE
DELAY
⑤ LATCH PULSE

* Actually, the phase error data is applied to the PWM circuit as 10 bit data.
The numerical value of the data will depends upon the cylinder motor phase.

Figure 3-8. Cylinder Phase Servo.

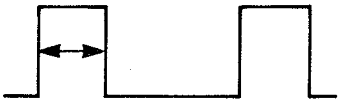
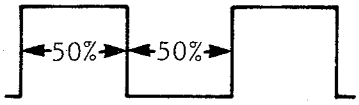
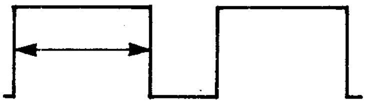
CYLINDER MOTOR PHASE	DELAY	PROPER PHASE	ADVANCE
THE PWM CIRCUIT OUTPUT	 The ON period becomes shorter.	 50% duty	 The ON period becomes longer.
LPF Output DC VOLTAGE	The voltage decreases.	Center Voltage (Approx. 2.5V)	The voltage increases.

Figure 3-9. PWM Output and Output DC Voltage.

In the Record mode, the reference signal of the cylinder phase comparator is the Vertical sync of the incoming video signal.

The phase relationship between the cylinder motor phase and the incoming video signal is controlled by the cylinder phase comparator. The phase relationship is converted to a variable pulse width signal by the Digital Phase Comparator and the PWM circuit, and then applied to the Low Pass Filter. Filtering the PWM output yields a DC voltage, which in turn, is used to control the phase of the cylinder motor.

If the cylinder motor is kept at the correct phase, a 50% duty square wave is applied to the Low Pass Filter which will keep the motor at the proper speed.

If the cylinder motor speed varies, the PWM output and the output DC voltage are changed as shown in Figure 3-9. Playback mode operates the same way, except that the counted down clock signal is used as the reference signal.

PRODUCING THE CONTROL PULSE

The servo circuit puts a reference signal or "Control signal" on the tape during the record mode so that the recording pattern can be duplicated during playback. (A special "Control Track" space is reserved on the tape for this purpose.) The control pulse is produced from the vertical sync of the incoming video signal (refer to Figure 3-10), and is applied to the control head through the delay circuit and an amplifier.

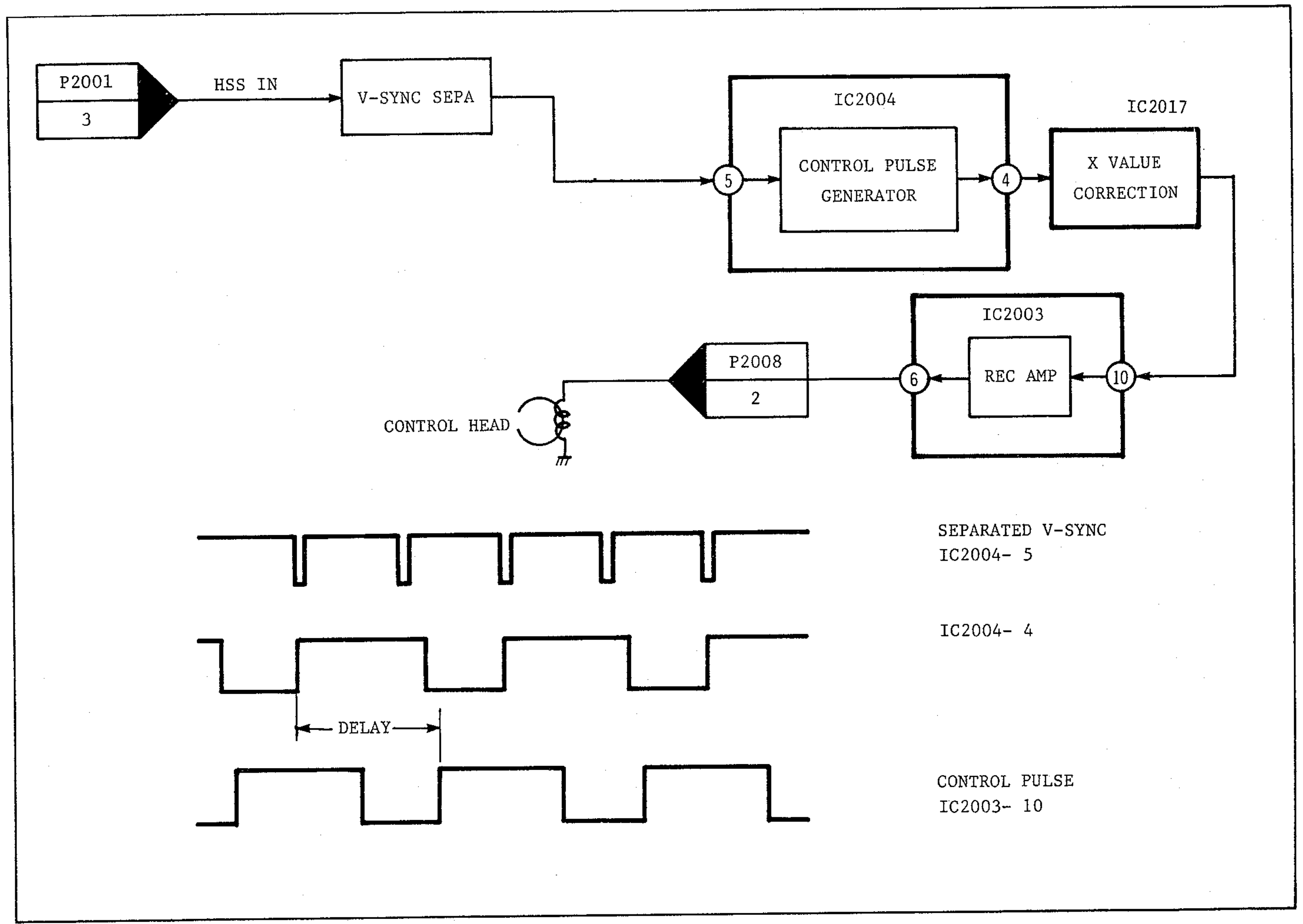

P2001
3
HSS IN
V-SYNC SEPA
IC2004
CONTROL PULSE GENERATOR
5
4
IC2017
X VALUE CORRECTION
IC2003
REC AMP
6
10
P2008
2
CONTROL HEAD
DELAY
SEPARATED V-SYNC
IC2004- 5
IC2004- 4
CONTROL PULSE
IC2003- 10

Figure 3-10. Producing of the Control Pulse.

CAPSTAN SERVO BASICS-RECORD AND PLAYBACK

It is advisable to read the Cylinder Servo Basics before this section because many of the same descriptions apply and won't be repeated here.

The function of the Capstan Servo is to move the tape past the video heads at a steady speed so that the video tracks will be placed on the tape in the desired pattern.

CAPSTAN SPEED CONTROL

The speed control of the capstan is similar to the cylinder speed control. The only difference is that the FG frequency is a 2160Hz sinewave counted down to 360Hz (Refer to Figure 3-11.)

CAPSTAN PHASE CONTROL

The phase control for the capstan is also similar to the cylinder phase control. In Record mode, a counted down clock signal is used as the reference signal (refer to Figure 3-11) and is phase synchronized with a counted down FG signal (30Hz), which is called the Capstan PG.

In Playback mode, the proper phase relationship between the cylinder servo and capstan should be kept. So, the reference signal of the capstan phase control is made from the signal from the cylinder phase control, and through the tracking monostable multivibrator. At the same time, the control signal that is recorded on the tape is picked up by the control head, and applied to the phase comparator as the variable signal, through the amplifier and the digital monostable multivibrator. The digital monostable multivibrator is used to delay the control signal.

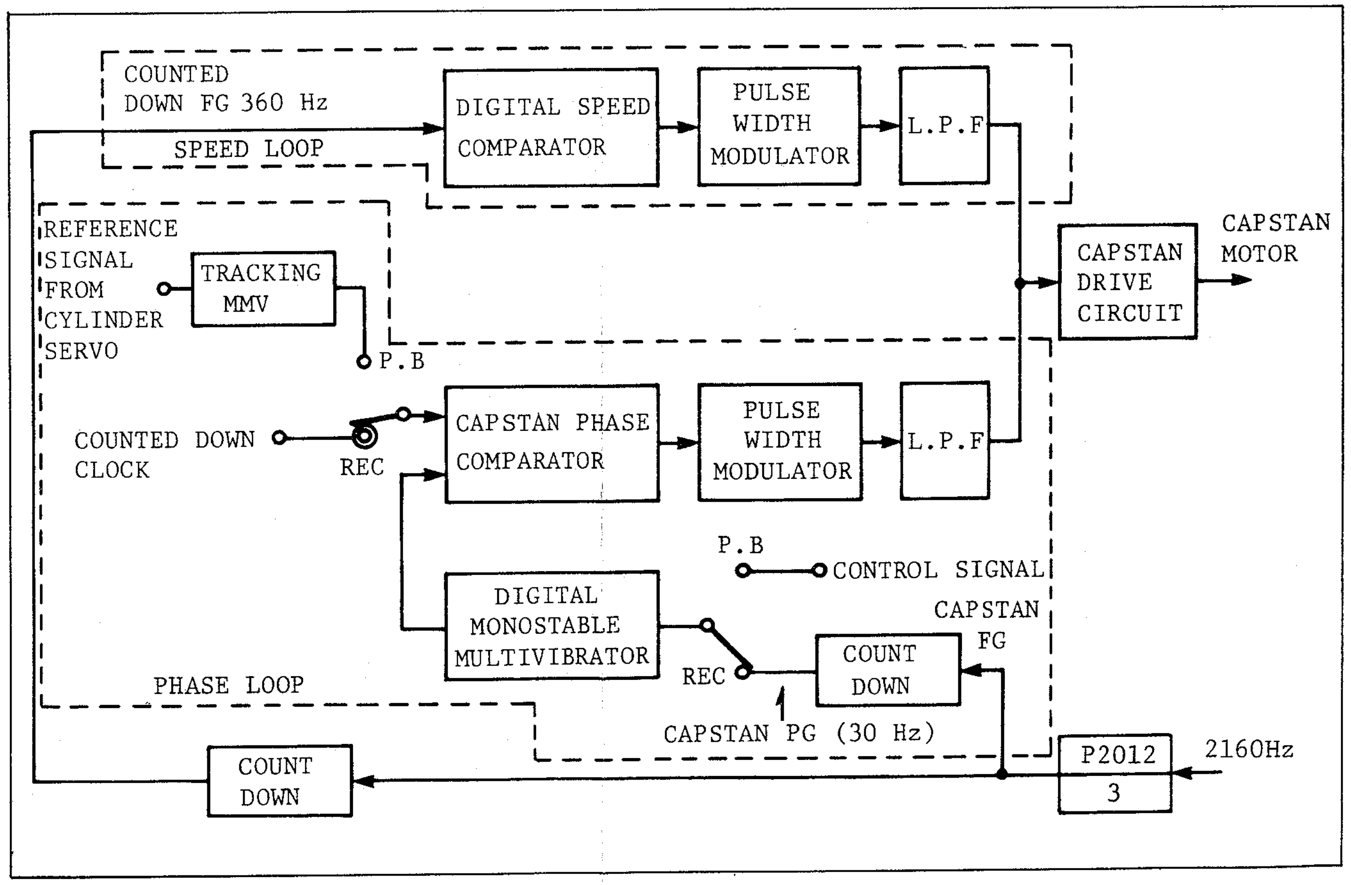

COUNTED DOWN FG 360 Hz
SPEED LOOP
DIGITAL SPEED COMPARATOR
PULSE WIDTH MODULATOR
L.P.F
CAPSTAN DRIVE CIRCUIT
CAPSTAN MOTOR
REFERENCE SIGNAL FROM CYLINDER SERVO
TRACKING MMV
P.B
COUNTED DOWN CLOCK
REC
CAPSTAN PHASE COMPARATOR
PULSE WIDTH MODULATOR
L.P.F
P.B
CONTROL SIGNAL
DIGITAL MONOSTABLE MULTIVIBRATOR
CAPSTAN FG
REC
COUNT DOWN
PHASE LOOP
CAPSTAN PG (30 Hz)
COUNT DOWN
P2012
3
2160Hz

Figure 3-11. Capstan Servo Basic Block Diagram.

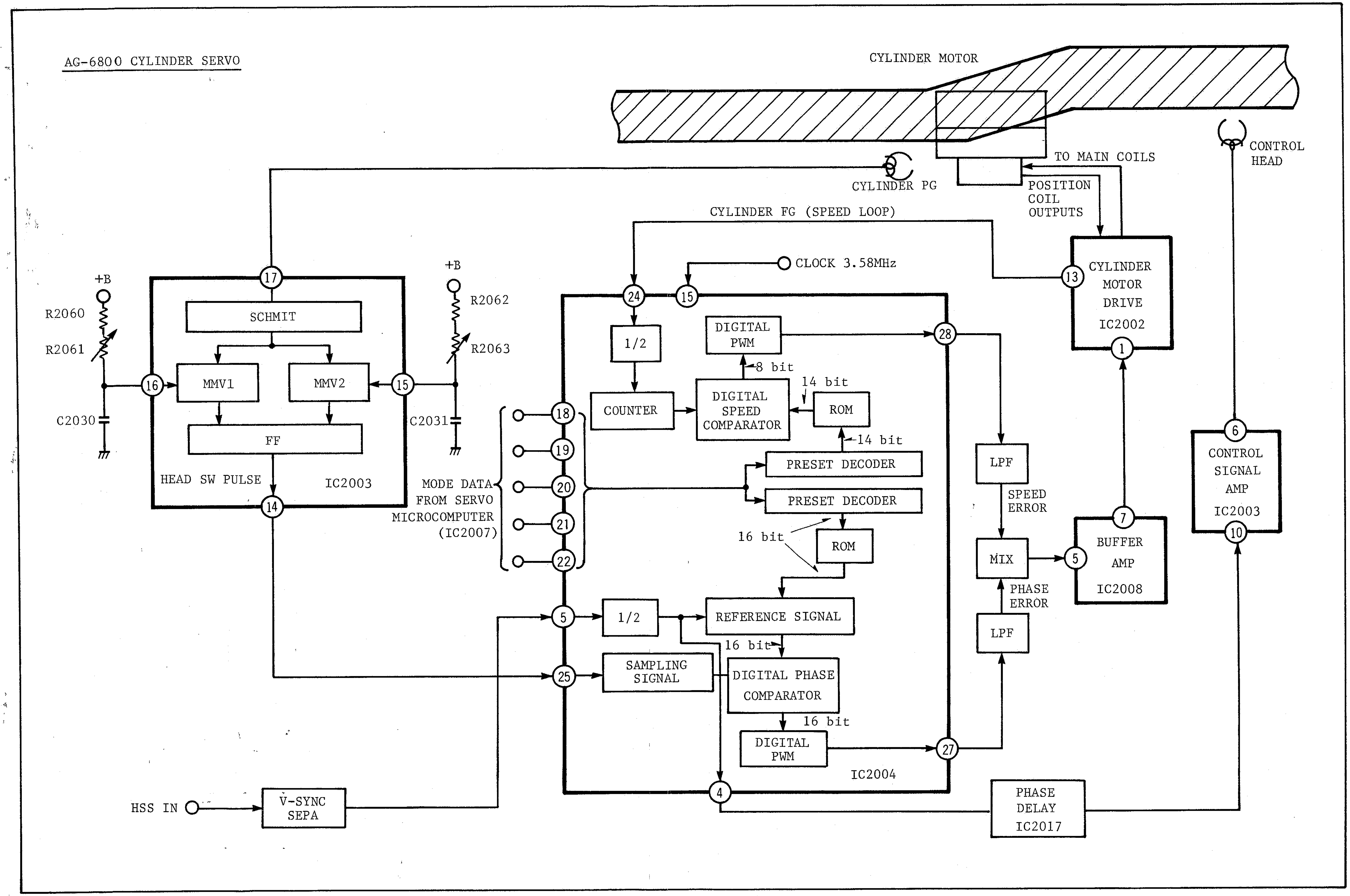

AG-6800 CYLINDER SERVO
CYLINDER MOTOR
TO MAIN COILS
CONTROL HEAD
CYLINDER PG
POSITION COIL OUTPUTS
CYLINDER FG (SPEED LOOP)
CLOCK 3.58MHz
CYLINDER MOTOR DRIVE
IC2002
13
1
+B
R2060
R2061
C2030
16
17
SCHMIT
MMV1
MMV2
FF
HEAD SW PULSE
IC2003
14
15
+B
R2062
R2063
C2031
24
15
1/2
COUNTER
DIGITAL PWM
8 bit
DIGITAL SPEED COMPARATOR
14 bit
ROM
14 bit
PRESET DECODER
PRESET DECODER
16 bit
ROM
18
19
20
21
22
MODE DATA FROM SERVO MICROCOMPUTER (IC2007)
28
LPF
SPEED ERROR
MIX
PHASE ERROR
LPF
BUFFER AMP
IC2008
5
7
6
CONTROL SIGNAL AMP
IC2003
10
5
1/2
REFERENCE SIGNAL
16 bit
25
SAMPLING SIGNAL
DIGITAL PHASE COMPARATOR
16 bit
DIGITAL PWM
27
IC2004
4
PHASE DELAY
IC2017
HSS IN
V-SYNC SEPA

Figure 3-12. Cylinder Servo Block Diagram.

Detailed Description

Cylinder Servo

Figure 3-12 shows the main components of the Cylinder servo. Refer to this diagram to aid in identifying the various components described below.

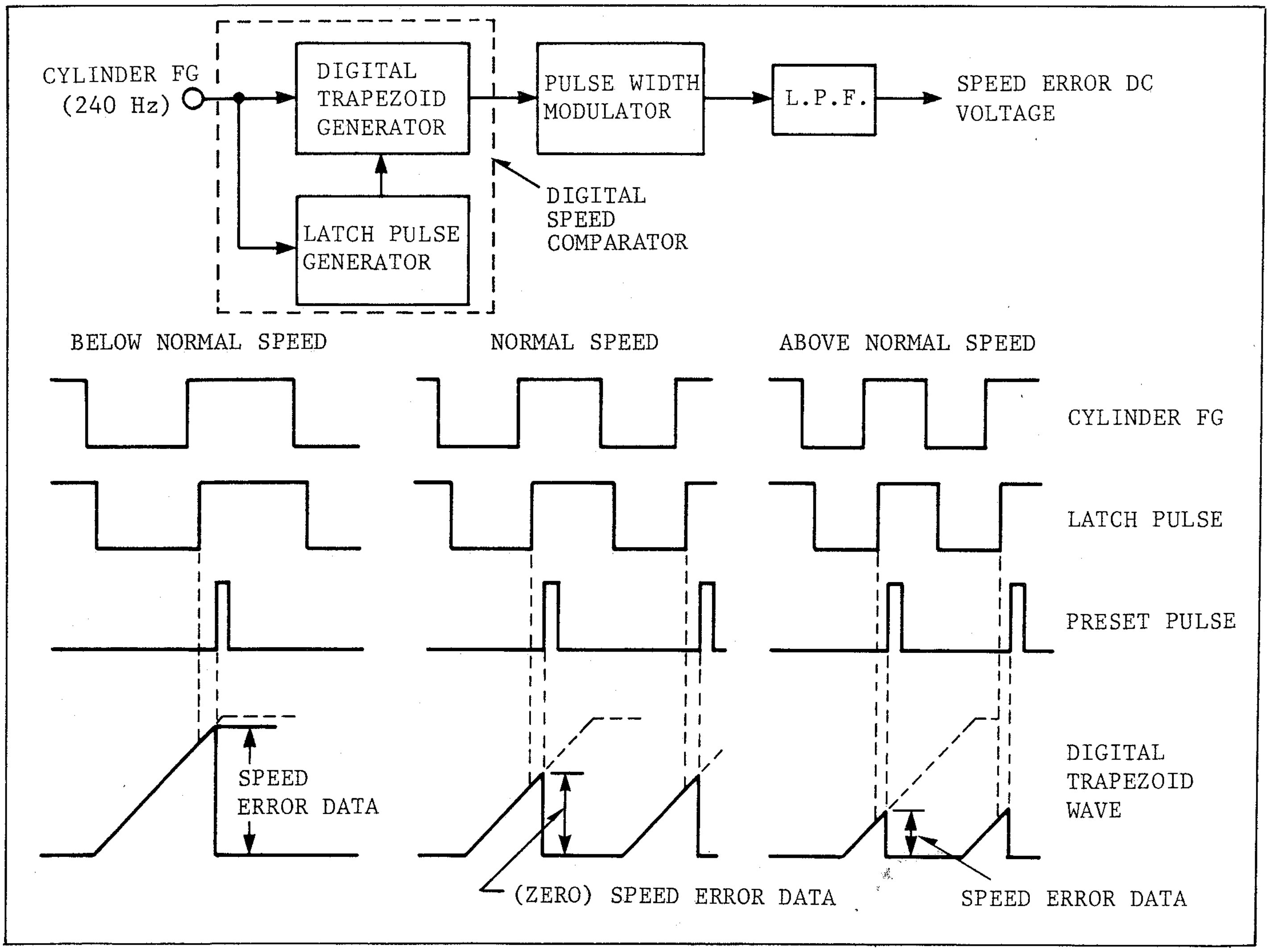
CYLINDER SPEED CONTROL

(1) CYLINDER FG

The cylinder FG signal is a 240Hz square wave which is produced by the position coils and the cylinder drive IC (IC2002: AN6677). The generation of the cylinder FG is described later in the cylinder drive section. The cylinder FG frequency corresponds to the speed of the cylinder motor.

(2) CYLINDER SPEED COMPARATOR

The cylinder FG signal which varies according to the cylinder speed is applied to the speed comparator and is converted to 8 bit digital speed error data.
As mentioned in the General Description, this is a Digital Comparator which generates the error signal in the form of 8-bit data. The description here uses the concept of a digital trapezoid wave to represent the data only for ease in understanding.
The digital trapezoid wave and the latch Pulse are produced from the cylinder FG signal. The latch pulse samples a point on the slope of the digital trapezoid wave.



CYLINDER FG
(240 Hz)
DIGITAL TRAPEZOID GENERATOR
LATCH PULSE GENERATOR
PULSE WIDTH MODULATOR
L.P.F.
SPEED ERROR DC VOLTAGE
DIGITAL SPEED COMPARATOR
BELOW NORMAL SPEED
NORMAL SPEED
ABOVE NORMAL SPEED
CYLINDER FG
LATCH PULSE
PRESET PULSE
DIGITAL TRAPEZOID WAVE
SPEED ERROR DATA
(ZERO) SPEED ERROR DATA
SPEED ERROR DATA

Figure 3-13. Cylinder Speed Control.

When the cylinder speed is normal (1,800RPM), the latch pulse samples the midpoint of the trapezoid which gives the correct Speed Error Data for no change in motor speed.
If the motor speed increases, the latch pulse period decreases and therefore samples the trapezoid below the midpoint, causing the Speed Error Data to decrease.

If the motor speed decreases, the latch pulse period increases, the trapezoid is sampled above the midpoint, causing the Speed Error Data to increase.

For the Cylinder Speed Comparator, the frequency of the clock pulse is given as follows:

$$\frac{fsc}{2^4} = \frac{3579545}{2^4} = 223.722\text{kHz}$$

fsc = 3579545Hz

Since 8-bit error data is used, the output range of the speed comparator is 0 to 255 which is enough to accurately control the cylinder speed. The output range is derived from:

$$2^8 - 1 = 255$$

(3) CYLINDER SPEED PWM CIRCUIT

The PWM is used to convert the 8-bit parallel error data into a single pulse width modulated waveform. This is done to allow transmission of the error signal over a single line instead of 8 parallel lines.
When the cylinder motor speed is correct, the proper speed data is applied to the PWM circuit and the PWM circuit produces a 50% duty cycle square wave (refer to Figure 3-14).

If the motor speed increases, the error data value decreases, and the on period of the PWM becomes longer.
If the motor speed decreases, the error data value increases, and the on period of the PWM becomes shorter.
Therefore, the duty cycle of the PWM circuit output indicates the speed error of the cylinder motor. The PWM circuit includes an 8 bit Binary Counter, so the PWM circuit can receive the 8 bit speed error data directly from the cylinder speed comparator.

However, the clock pulse frequency of the PWM circuit is different from the clock frequency of the Speed Comparator given above.
For the PWM, the clock frequency is given directly by:

fsc = 3.579545MHz

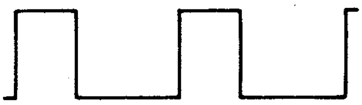
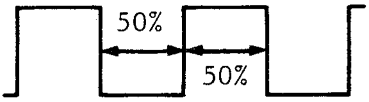
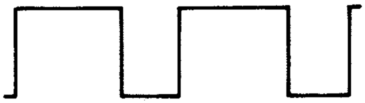
CYLINDER MOTOR SPEED	SLOWER ROTATION	PROPER ROTATION	FASTER ROTATION
8 bit error Data	INCREASE	PROPER DATA	DECREASE
CYLINDER SPEED PWM OUTPUT	 The ON period becomes shorter.	 50% duty cycle	 The ON period becomes longer.

Figure 3-14. Cylinder Speed PWM Circuit.

From this, the PWM circuit output frequency is given by the following expression:

$$\frac{\text{Clock Frequency}}{\text{Counter Number}} = \frac{fsc}{2^8} = \frac{3579545}{2^8}$$
$$= 13.983\text{kHz}$$

(4) LOW PASS FILTER

The PWM output is converted into a DC voltage by the low pass filter consisting of R2029 and C2011 (refer to Figure 3-15).
Then the speed error DC voltage is mixed with the phase error DC voltage which comes from the Cylinder Phase Control (described in the next section).
As was described, the speed error data can be any one of 256 levels (0 to 255).
Since the drive voltage of the cylinder Drive IC is 5V, one unit is approximately 0.02V which is accurate enough for control of the Cylinder Motor Speed.

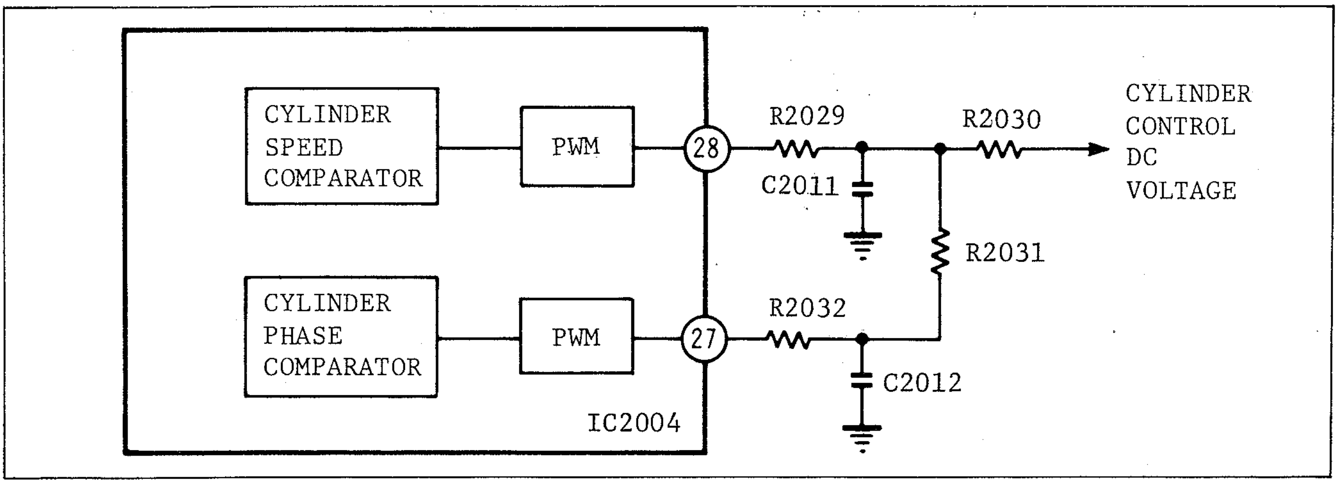

CYLINDER SPEED COMPARATOR
PWM
28
R2029
C2011
R2030
CYLINDER CONTROL DC VOLTAGE
R2031
CYLINDER PHASE COMPARATOR
PWM
27
R2032
C2012
IC2004

Figure 3-15. Low Pass Filter.

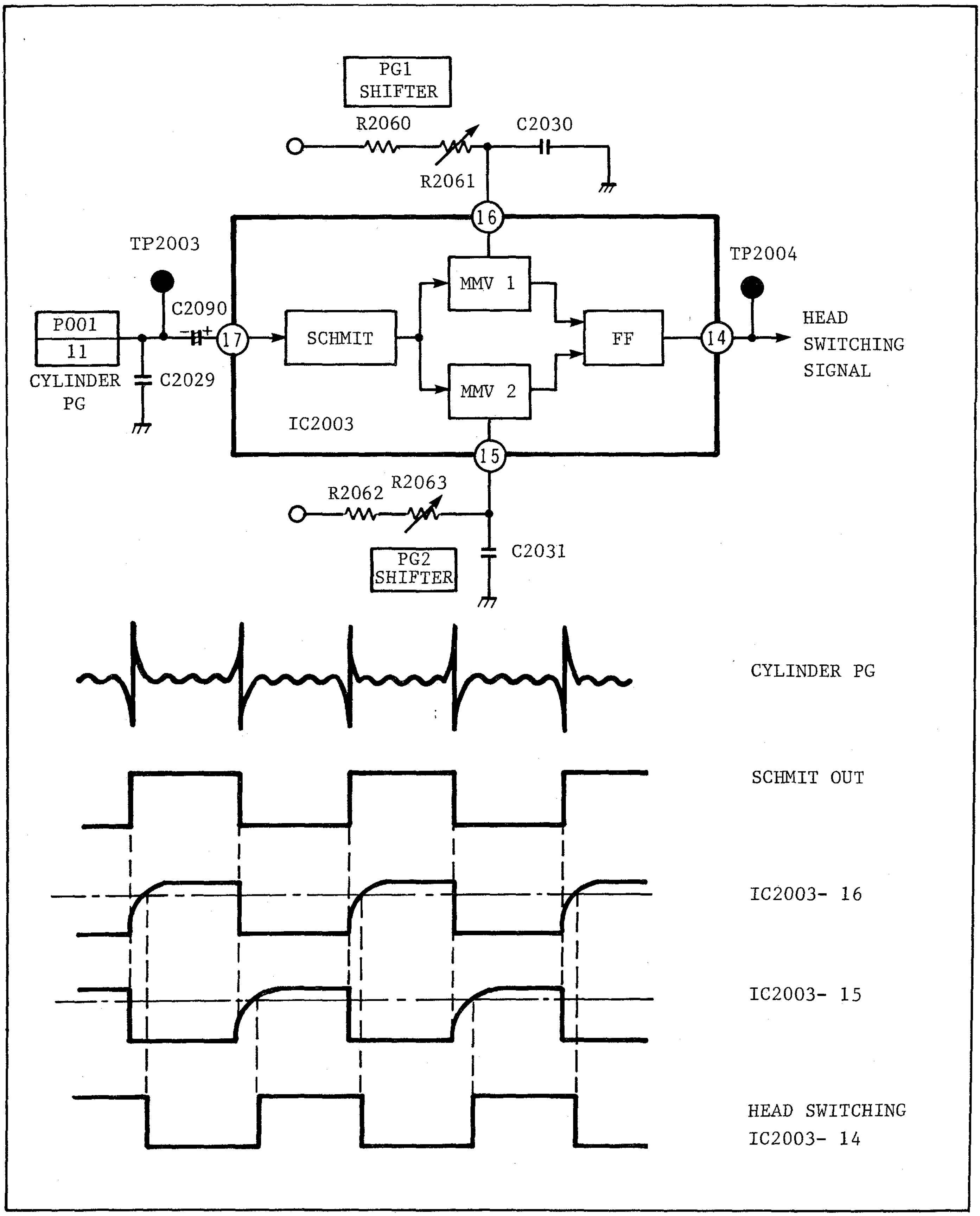

PG1
SHIFTER
R2060
C2030
R2061
16
TP2003
TP2004
MMV 1
C2090
P001
11
17
SCHMIT
FF
14
HEAD
SWITCHING
SIGNAL
CYLINDER
PG
C2029
MMV 2
IC2003
15
R2062
R2063
PG2
SHIFTER
C2031
CYLINDER PG
SCHMIT OUT
IC2003- 16
IC2003- 15
HEAD SWITCHING
IC2003- 14

Figure 3-16. Head Switching Pulse Generator.

(1) HEAD SWITCHING PULSE

To produce the head switching pulse, the cylinder PG signal is used. The cylinder PG signal is supplied to the Schmit circuit which produces a 30Hz square wave signal (refer to Figure 3-16). This 30Hz square wave signal is sent to the monostable multivibrator which is used to adjust the position of the rising and falling edges of the head switching signal. The time constants of the multivibrators are adjusted by the variable resistors, R2061 and R2063, (called "PG SHIFTER") for exactly 50%, duty cycle of the head switching pulse. For head switching, the "A" playback channel is turned OFF when used square wave goes high and when the square wave goes low, the "B" playback channel is turned OFF. This is done to prevent any possible noise from the unused video head.

The head switching signal is also used in the Cylinder Phase Control to produce the latch pulse.

(2) V-SYNC SEPARATOR

The V-Sync separator circuit consists of RC integrator and differentiator circuits, and the inverter Q2002. The waveforms show the sync separation process.

As explained in the General Description in the record mode the vertical sync signal is needed for the reference signal in order to produce the digital trapezoidal wave of the phase comparator. The H-Sync signal from Chrominance Circuit is supplied to the V-Sync separator circuit (Figure 3-17).

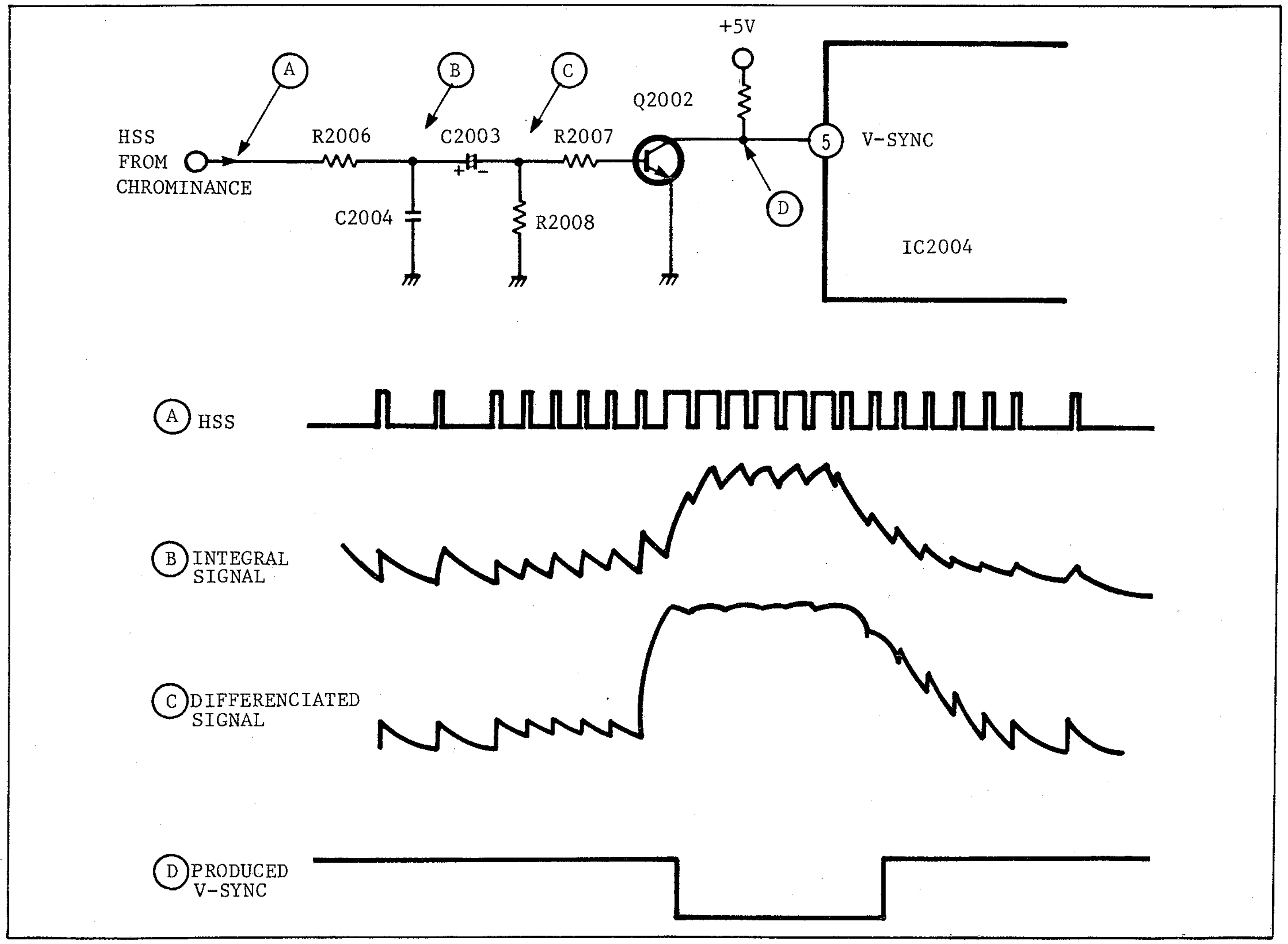

+5V
A
B
C
Q2002
HSS
FROM
CHROMINANCE
R2006
C2003
R2007
5
V-SYNC
C2004
R2008
D
IC2004
A HSS
B INTEGRAL SIGNAL
C DIFFERENCIATED SIGNAL
D PRODUCED V-SYNC

Figure 3-17. V-Sync Separator.

(3) CYLINDER PHASE COMPARATOR

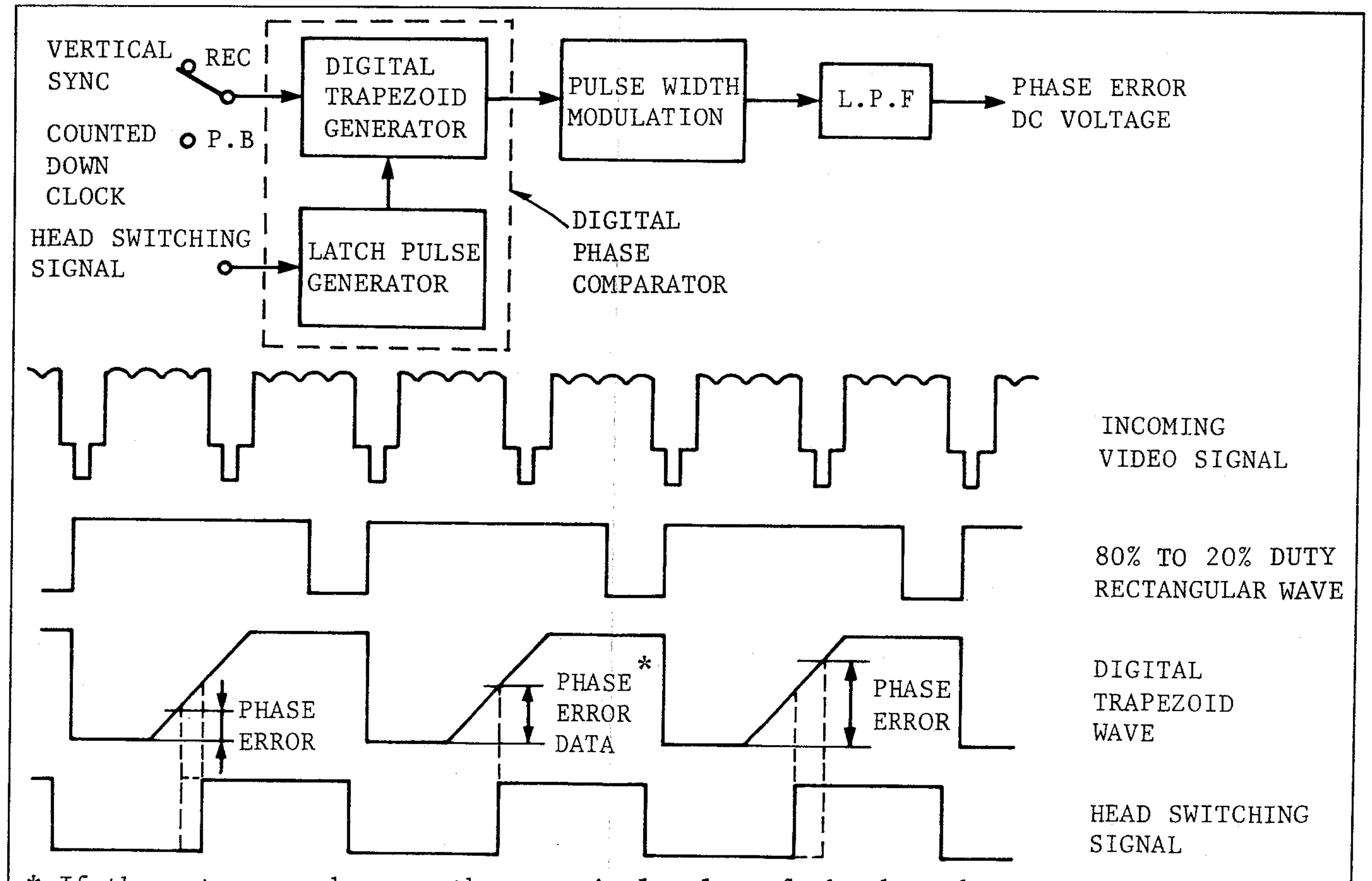
In the record mode, the Cylinder Phase Control Circuit locks the motor to the incoming vertical sync. Phase comparison between the motor and vertical sync is performed by the cylinder phase comparator, and 10 bit phase error data is produced. The digital trapezoid wave is produced from the vertical sync of the incoming video signal as follows (refer to Figure 3-18). First, the vertical sync (60Hz) is converted to a 30Hz rectangular wave of 80-20% duty cycle which produces the digital trapezoid wave. Note that triggering by the vertical sync can only occur during the low level of this waveform, thus improving noise immunity. The head switching pulse which is produced from the cylinder PG signal then produces the Latch Pulse. The latch pulse samples a point on the slope of the digital trapezoid wave to generate the 10-bit Phase Error Data.

The Phase Error Data sampling process is similar to that described for the CYLINDER SPEED COMPARATOR above. A more detailed circuit operation is in the DIGITAL PHASE COMPARATOR section. The clock pulse frequency of the cylinder phase control is given by:

$$\frac{fsc}{2^2} = \frac{3579545}{2^2} = 894.886\text{kHz}$$

$$fsc = 3579545\text{Hz}$$

The error data is 10 bit, so the output can be one of 1024 levels (since $2^{10} = 1024$), which is enough to accurately control the cylinder phase. In the playback mode, the digital trapezoid wave, is produced from a counted down clock signal in place of the vertical sync. The clock pulse is produced from a crystal oscillator, which results in a stable reference signal.


VERTICAL SYNC
REC
COUNTED DOWN CLOCK
P.B
DIGITAL TRAPEZOID GENERATOR
PULSE WIDTH MODULATION
L.P.F
PHASE ERROR DC VOLTAGE
HEAD SWITCHING SIGNAL
LATCH PULSE GENERATOR
DIGITAL PHASE COMPARATOR
INCOMING VIDEO SIGNAL
80% TO 20% DUTY RECTANGULAR WAVE
PHASE ERROR
PHASE ERROR DATA *
PHASE ERROR
DIGITAL TRAPEZOID WAVE
HEAD SWITCHING SIGNAL

* If the motor speeds up, the numerical value of the data decreases.
If the motor slows down, the numerical value of the data increases.

Figure 3-18. Cylinder Phase Control.

(4) SELF-OSCILLATION FUNCTION

In the record mode, the Phase Comparator has a self-oscillation function which is necessary to maintain servo lock even if vertical sync is momentarily missing.
When this occurs, the digital trapezoid wave generator oscillates with a time period of 35.0msec which is longer than the normal trapezoid wave interval (33.3msec: 30Hz).
The difference in the trapezoid wave period is within acceptable tolerance for the servo system when it is limited to momentary loss of sync only.
Note that the same self-oscillation will occur in PB mode if the input clock is lost for any reason. However, this function is meant to maintain the trapezoid wave only for momentarily loss of vertical sync, and not for a sustained loss of the PB clock signal.

(5) CYLINDER PHASE PWM CIRCUIT

The 10 bit phase error data is converted into pulses of variable width by the PWM circuit (Pulse Width Modulation).
The PWM circuit operation is similar to the description given in the CYLINDER SPEED PWM circuit above except for the bit number.

Using the same clock pulse frequency of:

fsc = 3.579545MHz

The Phase PWM circuit output frequency is given by the following expression.

$$\frac{\text{Clock Frequency}}{\text{Counter Number}} = \frac{fsc}{2^{10}} = 3.496\text{kHz}$$

(6) LOW PASS FILTER

The phase error data from the cylinder phase PWM circuit is converted into a DC voltage by the low pass filter consisting of R2032 and C2012 (refer to Figure 3-19).
Then the DC voltage is applied to the cylinder drive circuit with the DC voltage from the cylinder speed control.
The output from the cylinder phase control can be any one of 1024 levels, which is enough to accurately control the motor speed.

(7) OUTPUT OP AMP

The output range of the low pass filter is 0 to 5V DC. However since the drive voltage of the cylinder drive IC is +12V, it is necessary to increase the cylinder motor torque control voltage from 5V max. to 12V max. This is achieved by the operational amplifier inside of IC2008 (See Figure 3-19). Finally, the cylinder torque control voltage is applied to the cylinder motor drive circuit.

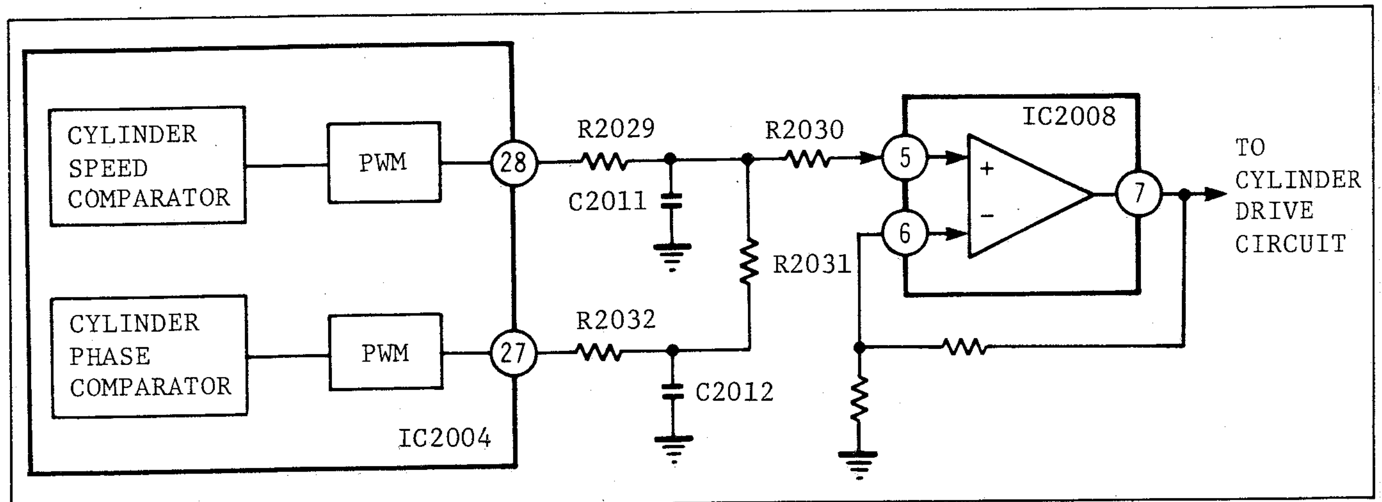

CYLINDER SPEED COMPARATOR
PWM
CYLINDER PHASE COMPARATOR
PWM
IC2004
28
27
R2029
C2011
R2030
R2031
R2032
C2012
IC2008
5
6
7
+
-
TO CYLINDER DRIVE CIRCUIT

Figure 3-19. Low Pass Filter & Output OP Amp.

CHANGING THE CYLINDER SPEED IN THE SEARCH PLAYBACK MODE WITH AG-A600

SEARCH FWD	Tape speed is changed.	1/5 ∿ 10 times Normal Speed
SEARCH REV	Tape movement is reversed, and speed is changed.	1/5 ∿ 10 times Normal Speed
PAUSE (STILL)	Tape is stopped.	Stop

Figure 3-20. Tape Speeds in Search Playback.

In search Playback mode by using Remote controller AG-A600, the tape speed is changed as shown in the chart of Figure 3-20.
In normal P.B, the track patterns are correctly traced by the video heads when the Cylinder speed is locked to the 30Hz frame rate.
However, at other than normal PB speed, the change in tape speed causes the video heads to trace the recorded tracks at an angle and will therefore scan more or less than the normal 262.5H lines as shown in Figures 3-21 and 3-22. To correct the resulting distortion that this will cause in the PB picture, the Cylinder speed must be increased slightly in the Search-Forward mode, and decreased slightly in the Search Reverse mode.

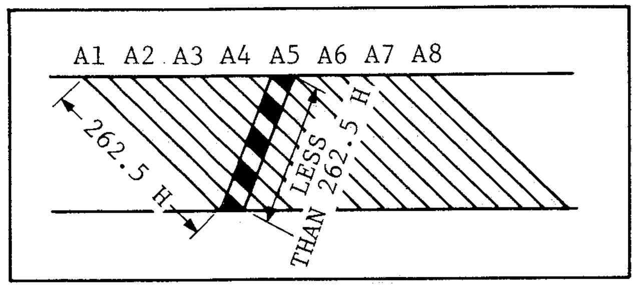


Figure 3-21. Search-Forward Mode.

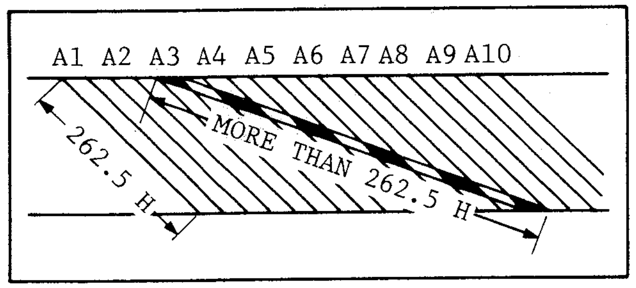


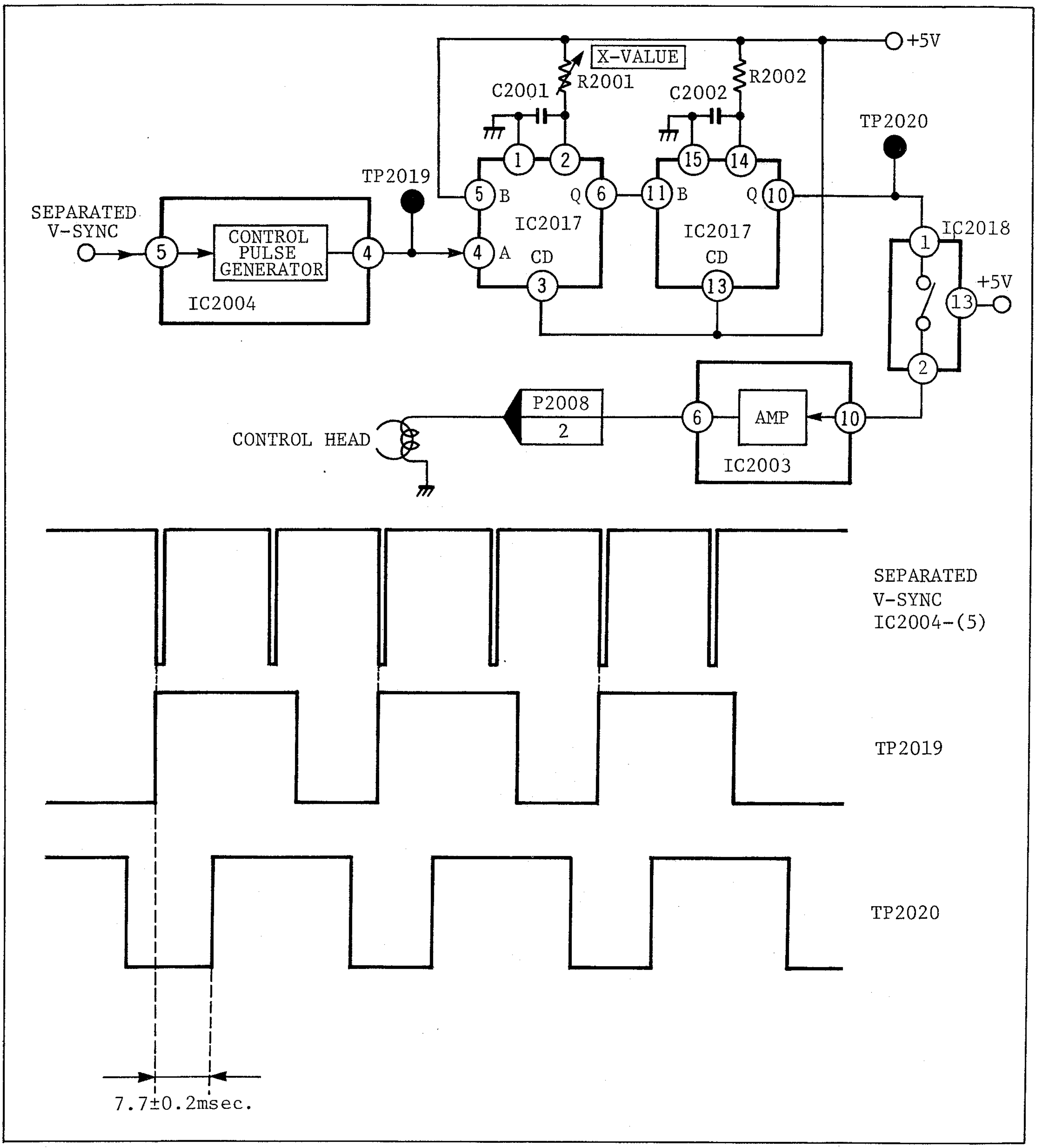
Figure 3-22. Search-Reverse Mode.

In Slow Search or Pause (Still) mode, the effective head to tape speed would also be increased slightly, and therefore the cylinder motor speed should be decreased slightly to compensate for this. These operations are performed inside of IC2004 by changing the reference signal. (Refer to Figure 3-12.)

PRODUCING THE CONTROL PULSE

There is one more function associated with the cylinder servo operation which must be mentioned before proceeding with the capstan servo, and that is the control pulse signal (CTL). In the Record mode, the control signal is produced from the Vertical sync which is stripped from the incoming video signal (refer to Figure 3-23).
The control pulse generator signal, which is synchronized with the vertical sync, has a duty cycle of 60% high to 40% low.
This signal is applied from pin 4 of IC2004 to pin 4 of IC2017. IC2017 is a monostable multivibrator used to produce a phase delay which is determined by the external capacitor-resistor combination C2001-R2001 and C2002-R2002. The control signal is delayed, and is then applied to the control head via an amplifier in IC2003.
The delay in the control signal is required to achieve interchangeability with other VHS machines because, in this VCR, the mechanical position of the Audio/Control Head Unit is slightly shifted to the head cylinder side. As will be explained in the Slow/Still section, the shift is essentially required to achieve the Noiseless Slow Operation.

The amount of shift is approximately 0.2mm. Therefore, if the control signal were recorded without any delay, the relationship between the position of the video heads and the control signal would not be the same as other VHS machines.



+5V
X-VALUE
R2001
C2001
R2002
C2002
TP2020
TP2019
SEPARATED V-SYNC
5
CONTROL PULSE GENERATOR
4
IC2004
5 B
Q 6
4 A
CD 3
IC2017
1
2
11 B
Q 10
15
14
IC2017
CD 13
IC2018
1
2
13
+5V
CONTROL HEAD
P2008
2
6
AMP
10
IC2003
SEPARATED V-SYNC IC2004-(5)
TP2019
TP2020
7.7±0.2msec.

Figure 3-23. Producing the Control Pulse.

CYLINDER MOTOR DRIVE

The video head cylinder motor is a Direct-Drive DC brushless motor. This kind of motor is chosen for its unequalled accuracy and durability.

Basically, the motor consists of a 16-pole ring magnet, 8 cutout windows, 3 position coils and 3 main coils separated into 12 poles (refer to Figure 3-24). The idea is to sequentially turn ON two of the 3 sets of main coils in a rotating direction so that the ring magnet follows. As soon as the magnet moves to follow, the position detectors will sense this and sequence the next set of main coils to keep the rotation going.

As the motor rotates, the position detection plate with 8 cutout windows will continually pass by the 3 stationary position coils.

The position sensors are actually transformer devices with primary and secondary windings mounted next to each other. A 65kHz sinewave signal is sent to the primary winding of each coil. As the cutout window passes over a coil, magnetic coupling transfers more energy into the secondary winding than in the case then the window is not present.

The result is that every secondary winding will have an amplitude modulated 65kHz signal present at its terminals (Figure 3-25). Since the motor normally spins at 30Hz (1,800RPM), each coil will see 8 windows per revolution and will produce a 240Hz (8x30) amplitude modulation on each output signal.

Because each coil is physically separated 120°, the 240Hz output of the 3 secondaries will be 120° apart from each other. Everytime the motor turns by 15 mechanical degrees, one of the secondaries will deliver a maximum output.

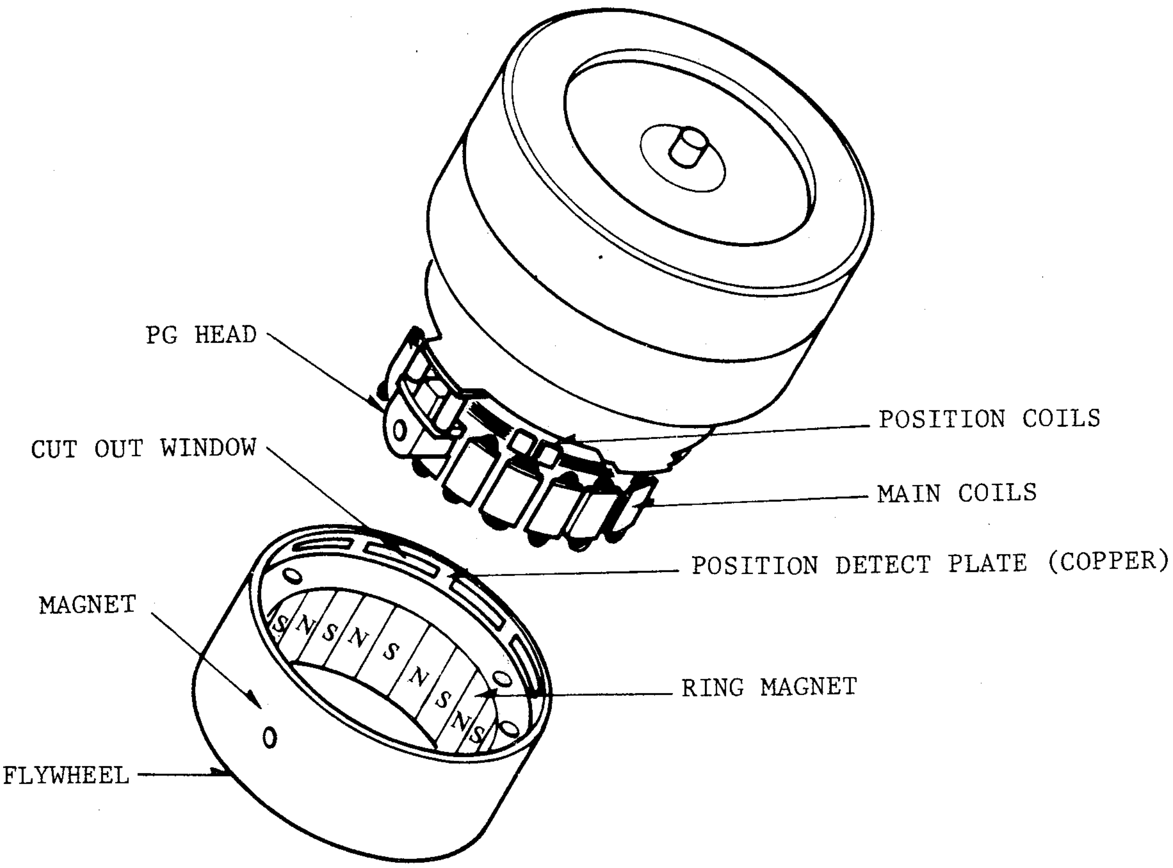


Figure 3-24. Cylinder Motor.

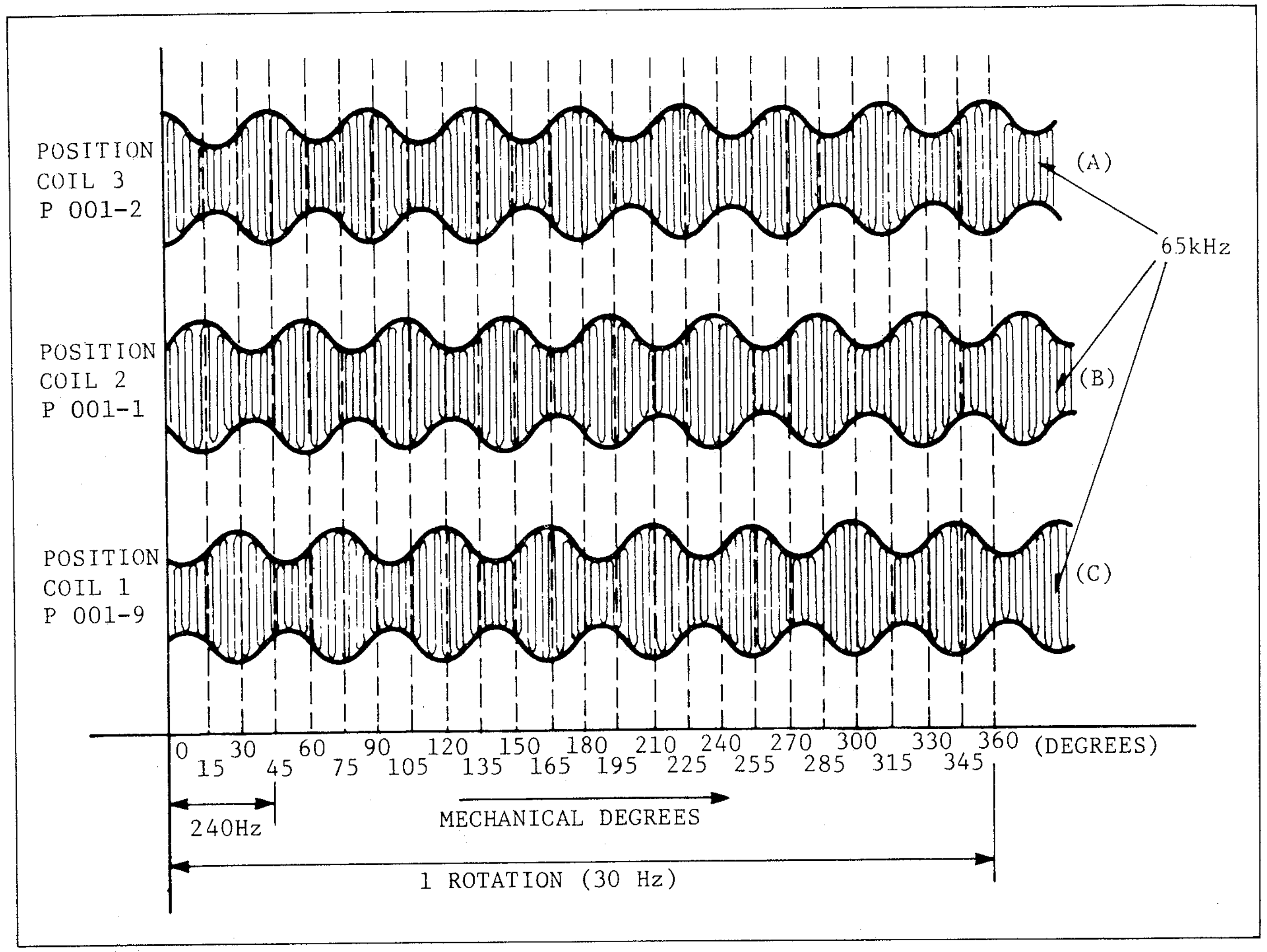


Figure 3-25. AM Modulated Cylinder Position Coil Outputs.

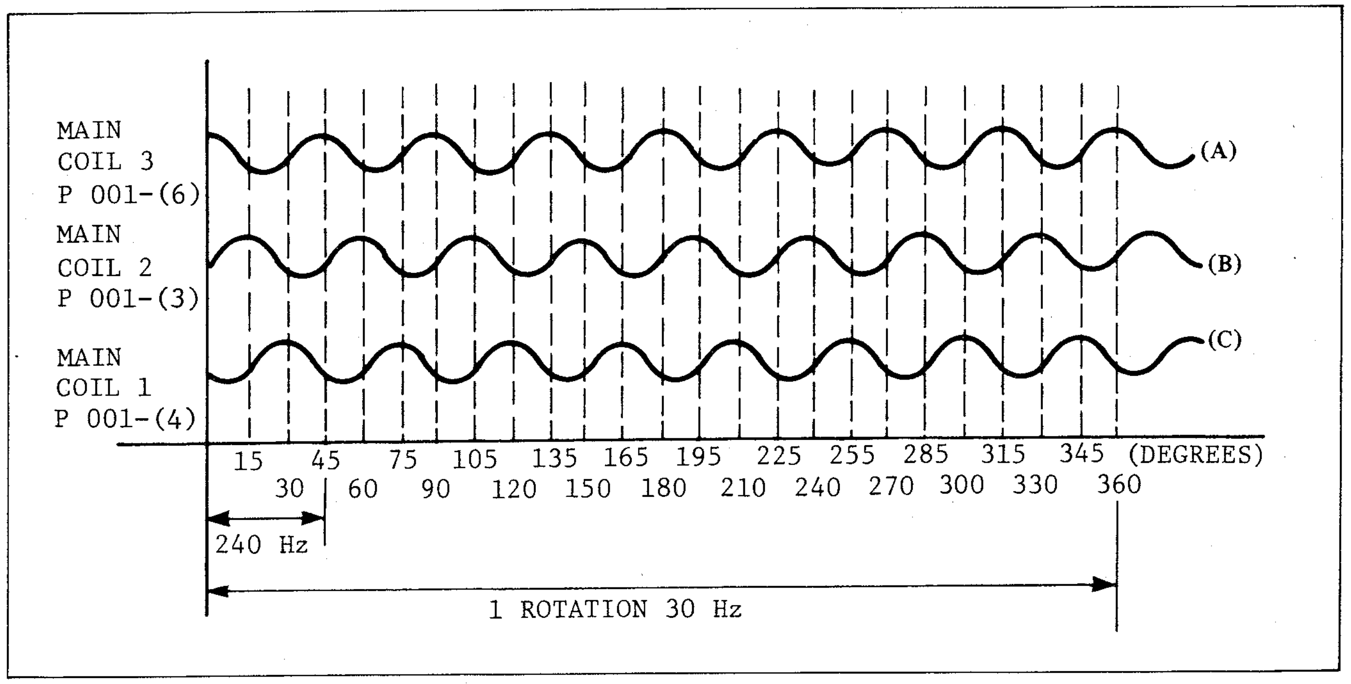


Figure 3-26. AM Detected Signals.

The three waveforms in Figure 3-25(A), (B) and (C) come from the three secondaries. If the signal from the secondaries is AM detected, the 65kHz carrier will be eliminated, and just the 240Hz signal will remain. All three AM detected signals are shown in Figure 3-26 which also shows the 120° relationship.

This processing is done inside of IC2002 on the DD Cylinder drive circuit board (refer to Figure 3-27). The 65kHz oscillator leaves pin 9 of IC2002 and passes to the primary coils via pin 8 of connector P001. The error voltage of the speed control circuit enters at pin 1 of IC2002, and the position coil secondary outputs enter at pins 3, 5 and 7, which is an AM detector circuit for the 240Hz AM signals.

The drive current, which is synchronized with the position coil signal, is applied through transistors, Q1, Q2 and Q3 to the main coils M1, M2 and M3 for rotation.

The amplitude of the current to the main coils is controlled by a Torque Control circuit. This circuit receives the error voltage and a measure of the drive transistors emitter current, and uses these inputs to adjust the control signals to the drive transistors (Q1, Q2, Q3).

Another function in IC2002 generates the FG signals for servo control.

The FG signal is formed from the AM detection position coil.

The three AM detection position coil outputs are fed to the FG process switching circuit, and are converted to the 240Hz FG signal which is synchronized with the position coil signal.

The speed control circuit will utilize the FG signal for both the trapezoidal wave and sampling pulses.

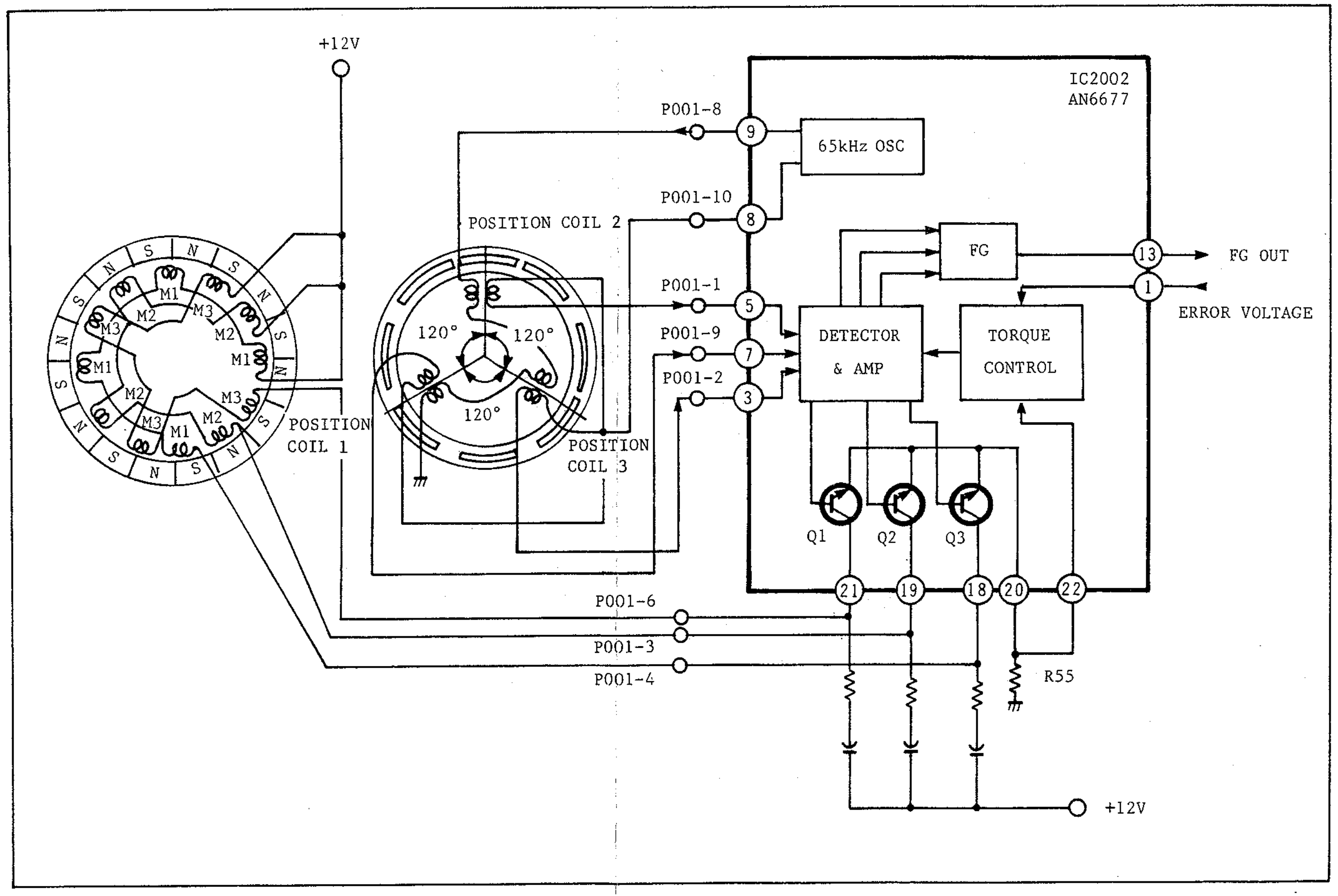
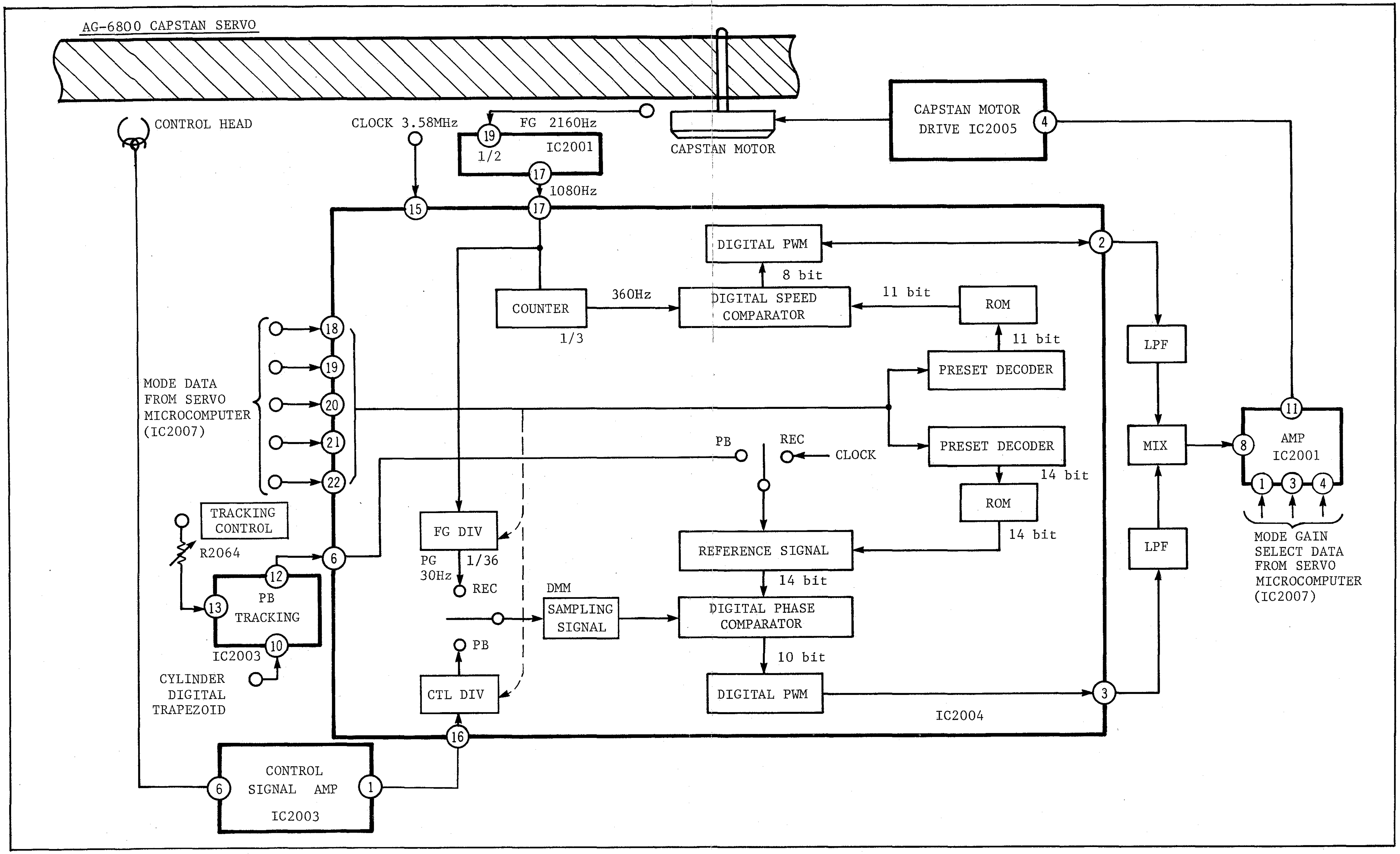

+12V
IC2002
AN6677
P001-8
P001-10
P001-1
P001-9
P001-2
65kHz OSC
FG
FG OUT
ERROR VOLTAGE
DETECTOR
& AMP
TORQUE
CONTROL
POSITION COIL 2
POSITION
COIL 1
POSITION
COIL 3
120°
120°
120°
M1
M2
M3
N
S
Q1
Q2
Q3
P001-6
P001-3
P001-4
R55
+12V
9
8
5
7
3
13
1
21
19
18
20
22

Figure 3-27. Cylinder Motor Drive Block Diagram.

Capstan Servo

The Block Diagram of Figure 3-28 shows the main components of the Capstan Servo. Refer to this diagram to aid in identifying the various components described below.



AG-6800 CAPSTAN SERVO
CONTROL HEAD
CLOCK 3.58MHz
19
FG 2160Hz
1/2
IC2001
17
1080Hz
CAPSTAN MOTOR
CAPSTAN MOTOR DRIVE IC2005
4
15
17
DIGITAL PWM
2
8 bit
COUNTER
360Hz
DIGITAL SPEED COMPARATOR
11 bit
ROM
1/3
11 bit
PRESET DECODER
LPF
MODE DATA FROM SERVO MICROCOMPUTER (IC2007)
18
19
20
21
22
PB
REC
CLOCK
PRESET DECODER
MIX
8
11
AMP IC2001
1
3
4
14 bit
ROM
14 bit
TRACKING CONTROL
R2064
FG DIV
REFERENCE SIGNAL
LPF
MODE GAIN SELECT DATA FROM SERVO MICROCOMPUTER (IC2007)
6
12
PG 30Hz
1/36
REC
14 bit
DMM
13
PB TRACKING
SAMPLING SIGNAL
DIGITAL PHASE COMPARATOR
IC2003
10
PB
10 bit
CYLINDER DIGITAL TRAPEZOID
CTL DIV
DIGITAL PWM
3
IC2004
16
6
CONTROL SIGNAL AMP
1
IC2003

Figure 3-28. Capstan Servo Block Diagram.

CAPSTAN SPEED CONTROL

(1) CAPSTAN FG PROCESSING

The capstan FG signal is used for capstan speed control in the REC and PB modes, and to generate the capstan PG signal.
The 2160Hz capstan FG signal from the Capstan motor is sent to the countdown circuit inside of IC2001 via pin 19 as shown in Figure 3-29. In any mode except slow, the capstan FG frequency is counted down in IC2001 and applied to pin 17 of IC2004 where it is counted down again to 360Hz for use by the Capstan Speed Comparator.

(2) CAPSTAN SPEED COMPARATOR

The 360Hz capstan FG signal is applied to the speed comparator (refer to Figure 3-30). The FG frequency which changes in proportion to the capstan motor speed, is converted to 8 bit digital speed error data. The circuit operation is similar to that described for the Cylinder Speed Comparator.

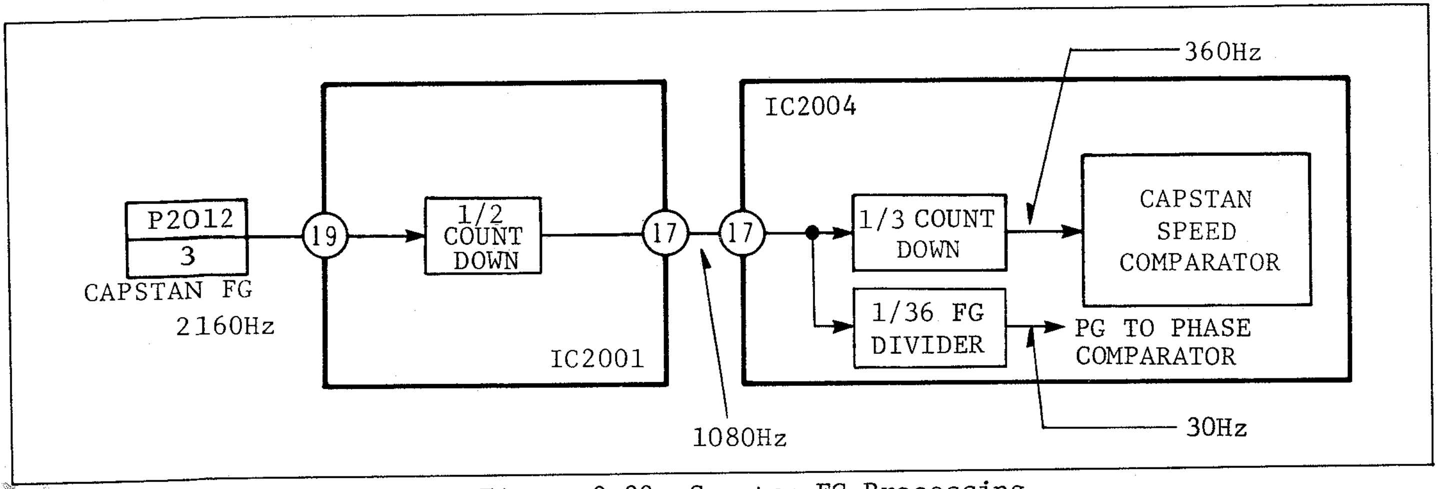

360Hz
IC2004
P2012
3
CAPSTAN FG
2160Hz
19
1/2 COUNT DOWN
17
17
1/3 COUNT DOWN
CAPSTAN SPEED COMPARATOR
1/36 FG DIVIDER
PG TO PHASE COMPARATOR
IC2001
1080Hz
30Hz

Figure 3-29. Capstan FG Processing.

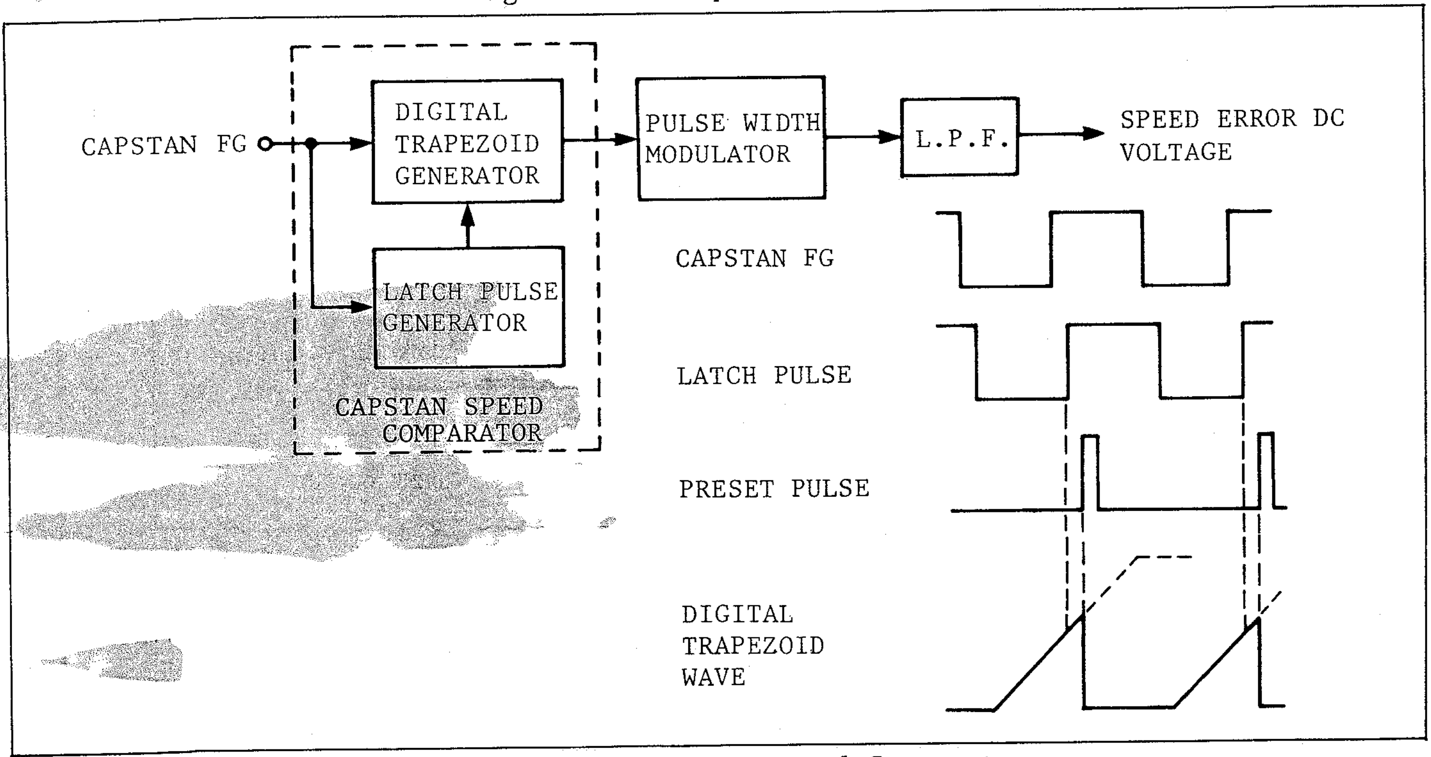

CAPSTAN FG
DIGITAL TRAPEZOID GENERATOR
LATCH PULSE GENERATOR
CAPSTAN SPEED COMPARATOR
PULSE WIDTH MODULATOR
L.P.F.
SPEED ERROR DC VOLTAGE
CAPSTAN FG
LATCH PULSE
PRESET PULSE
DIGITAL TRAPEZOID WAVE

Figure 3-30. Capstan Speed Comparator.

(4) POSITION SENSOR (COIL)

This sensor is similar to the cylinder motor (shown in Figure 3-27). A 60kHz sinewave inside IC2005 is supplied to the primary winding position coils, which are physically seated so that there is 100° between coil 1 and coil 2, 100° between coil 2 and coil 3, and 160° between coil 3 and coil 1 (refer to Figure 3-40). On the capstan shaft a metal piece with 6 cutout windows is mounted. When a cutout window passes over a position coil, magnetic coupling transfers more energy into the secondary coils than when the cutout window is not present. The result is that every secondary coil will have an amplitude modulated 60kHz signal present that is fed back to pins 11, 13 and 15 of IC2005. The Position Sensor (AM detector), eliminates the 60kHz carrier leaving only the 18Hz signal. The signal is then sent to the motor drive circuit.

(5) CAPSTAN DRIVE CIRCUIT

This circuit switches the 3 main coils. There are actually 9 poles 3 for each coil. If the 3 poles for each coil are engaged properly, one set of poles will push the magnet, the other set will pull the magnet, and the third remains inactive. This action drives the motor. A simplified schematic is shown in Figure 3-41. For easier understanding of the DD motor operation, assume that each output is either High, Low or Zero. Refer to the 36 periods on the waveforms in Figure 3-42. Looking at period 1, waveform (A) is High, waveform (B) is Low and waveform (C) is Zero. The other cases are as shown in Figure 3-43.
The transistor circuit actually forms the motor drive circuit. When one of the (A), (B) or (C) waveforms is High, the associated NPN transistor in the pre-drive section will turn ON. When the waveform is Low, the associated PNP transistor will turn ON. When the waveform is Zero, the associated transistor is OFF.

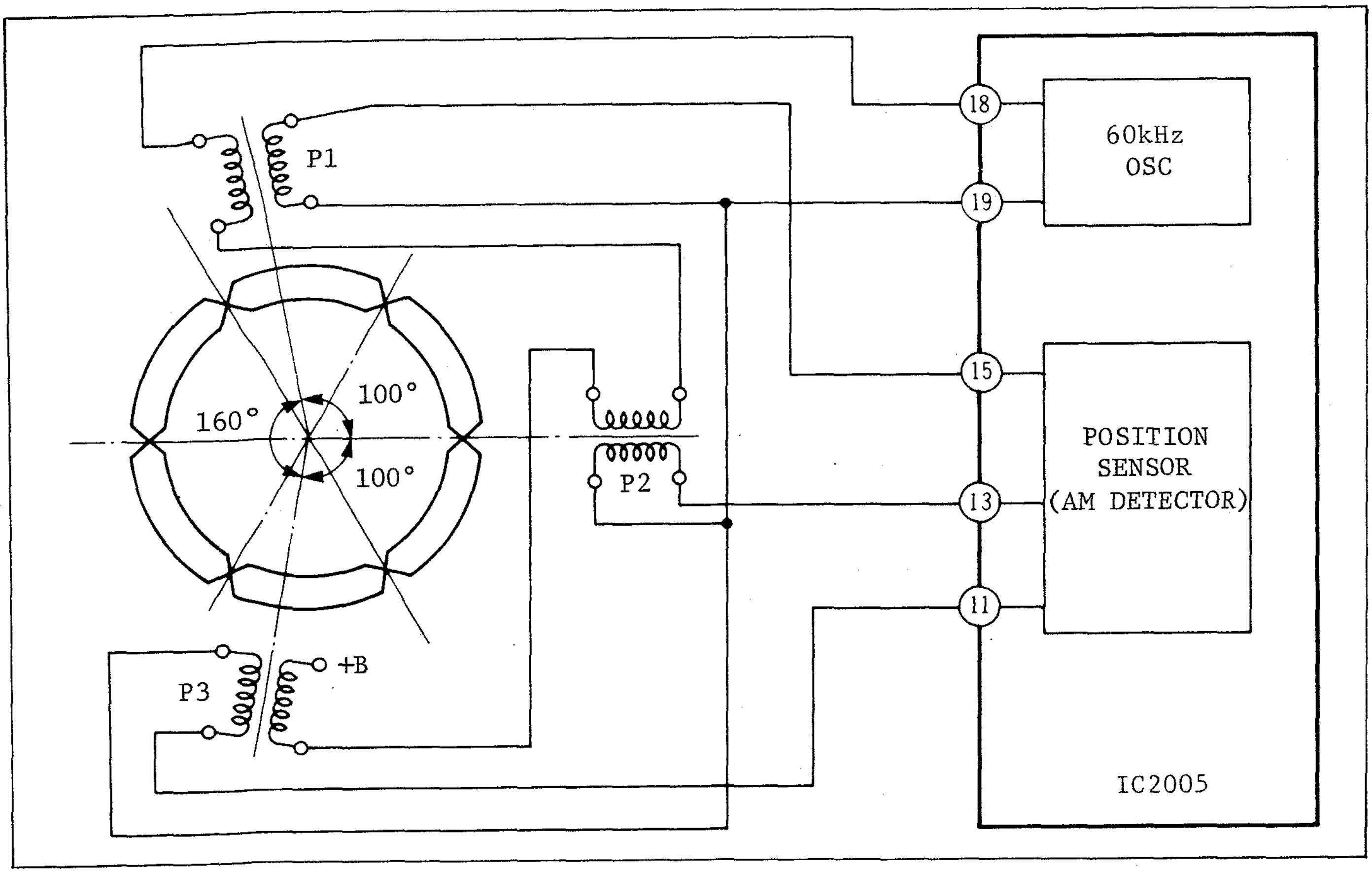


Figure 3-40. Capstan Motor Position Coils.

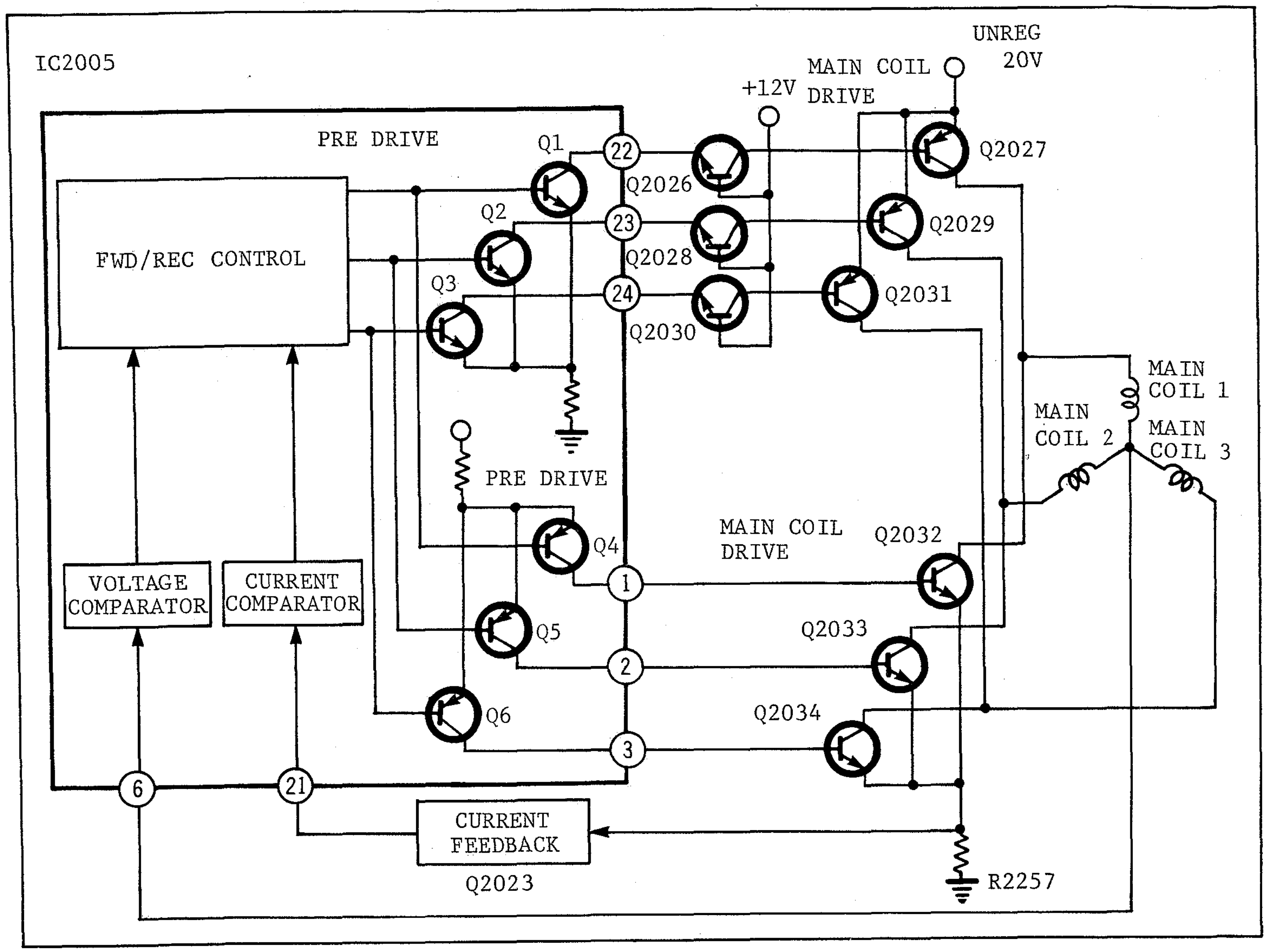

IC2005
PRE DRIVE
FWD/REC CONTROL
Q1
Q2
Q3
22
23
24
Q2026
Q2028
Q2030
+12V
MAIN COIL DRIVE
UNREG 20V
Q2027
Q2029
Q2031
MAIN COIL 1
MAIN COIL 2
MAIN COIL 3
PRE DRIVE
Q4
Q5
Q6
MAIN COIL DRIVE
Q2032
Q2033
Q2034
1
2
3
VOLTAGE COMPARATOR
CURRENT COMPARATOR
6
21
CURRENT FEEDBACK
Q2023
R2257

Figure 3-41. Main Coil Drive.

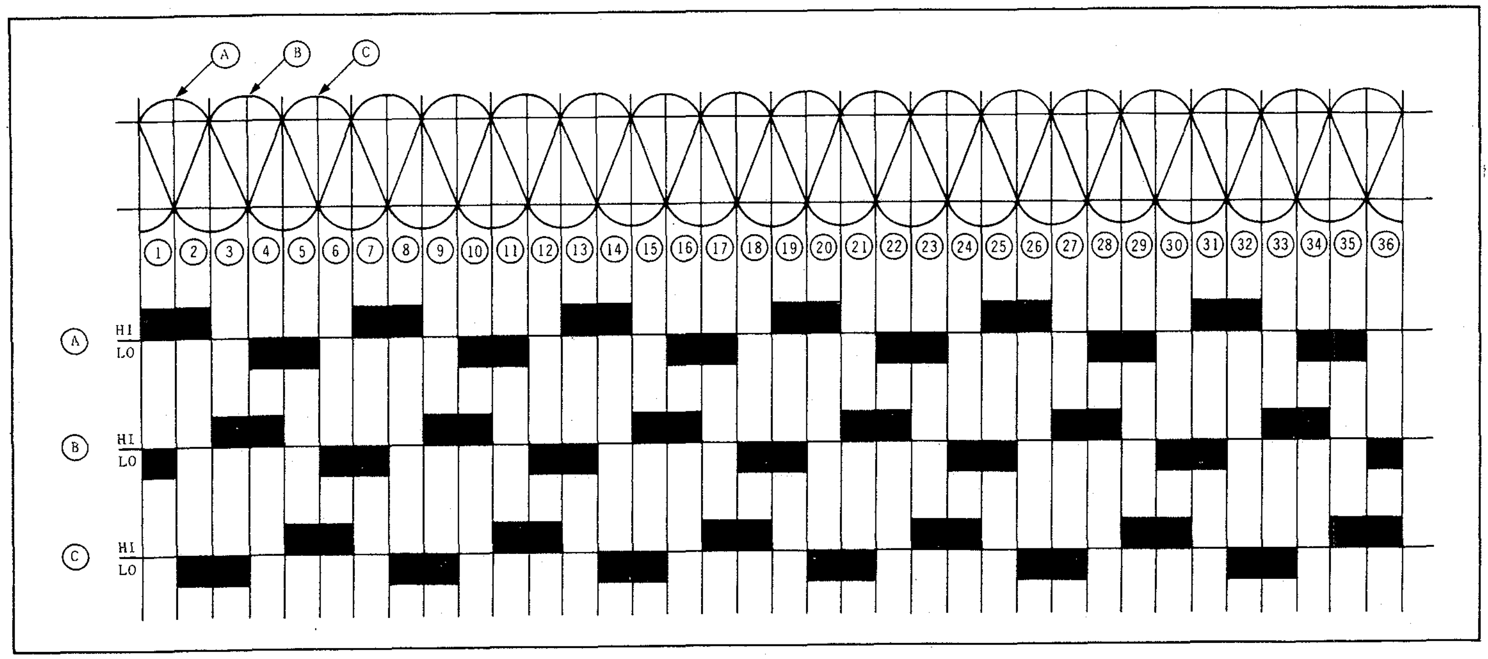


Figure 3-42. AM Detected Position Coil Signals.

Waveform Period						Ⓐ	Ⓑ	Ⓒ
①	⑦	⑬	⑲	㉕	㉛	Hi	Lo	O
②	⑧	⑭	⑳	㉖	㉜	Hi	O	Lo
③	⑨	⑮	㉑	㉗	㉝	O	Hi	Lo
④	⑩	⑯	㉒	㉘	㉞	Lo	Hi	O
⑤	⑪	⑰	㉓	㉙	㉟	Lo	O	Hi
⑥	⑫	⑱	㉔	㉚	㊱	O	Lo	Hi

Figure 3-43. Logic States of each Period on Figure 3-42.

Transistors Period						Q1 and Q26,Q27	Q2 and Q28,Q29	Q3 and Q30,Q31	Q6 and Q34	Q5 and Q33	Q4 and Q32
①	⑦	⑬	⑲	㉕	㉛	ON	OFF	OFF	OFF	ON	OFF
②	⑧	⑭	⑳	㉖	㉜	ON	OFF	OFF	OFF	OFF	ON
③	⑨	⑮	㉑	㉗	㉝	OFF	ON	OFF	OFF	OFF	ON
④	⑩	⑯	㉒	㉘	㉞	OFF	ON	OFF	ON	OFF	OFF
⑤	⑪	⑰	㉓	㉙	㉟	OFF	OFF	ON	ON	OFF	OFF
⑥	⑫	⑱	㉔	㉚	㊱	OFF	OFF	ON	OFF	ON	OFF

Figure 3-44. Main Coil Drive Transitors.

Period						Current Flow
①	⑦	⑬	⑲	㉕	㉛	B+ → Q27 → M1 → M2 → Q33
②	⑧	⑭	⑳	㉖	㉜	B+ → Q27 → M1 → M3 → Q34
③	⑨	⑮	㉑	㉗	㉝	B+ → Q29 → M2 → M3 → Q34
④	⑩	⑯	㉒	㉘	㉞	B+ → Q29 → M2 → M1 → Q32
⑤	⑪	⑰	㉓	㉙	㉟	B+ → Q31 → M3 → M1 → Q32
⑥	⑫	⑱	㉔	㉚	㊱	B+ → Q31 → M3 → M2 → Q33

Figure 3-45. Main Coil Current Flow.

Figure 3-44 shows transistor conduction for the 36 periods. As can be seen, at any particular period, 2 transistors are ON, driving 2 coils. Figure 3-45 shows current flow for the 36 periods.

This forms the basis of a direct drive DC brushless motor.

Since each output is assumed to be High, Low, or Zero, the waveforms at the three main coils 1, 2 and 3 result in square waveforms, but actually each output is a sinewave, not a squarewave.

INFRARED FG SYSTEM

The internal construction of the capstan motor is shown in Figure 3-46. The rotor has a round plate on which many slits are engraved. On the stator, there is a small plate on which some slits are also engraved.
There are 2 pairs of infrared FG's. Each FG consists of an LED and a photo transistor above and below the round plates. When the infrared ray from the LED is sensed by the photo transistor through both slits on the rotor and stator plates, a certain signal can be picked up.

The phase difference between FG1 and FG2 is 90°. These two signals are used to detect the capstan motor rotation direction (refer to Figure 3-47). The detection is required for the noiseless slow operation because reverse current braking is applied to stop the capstan motor.

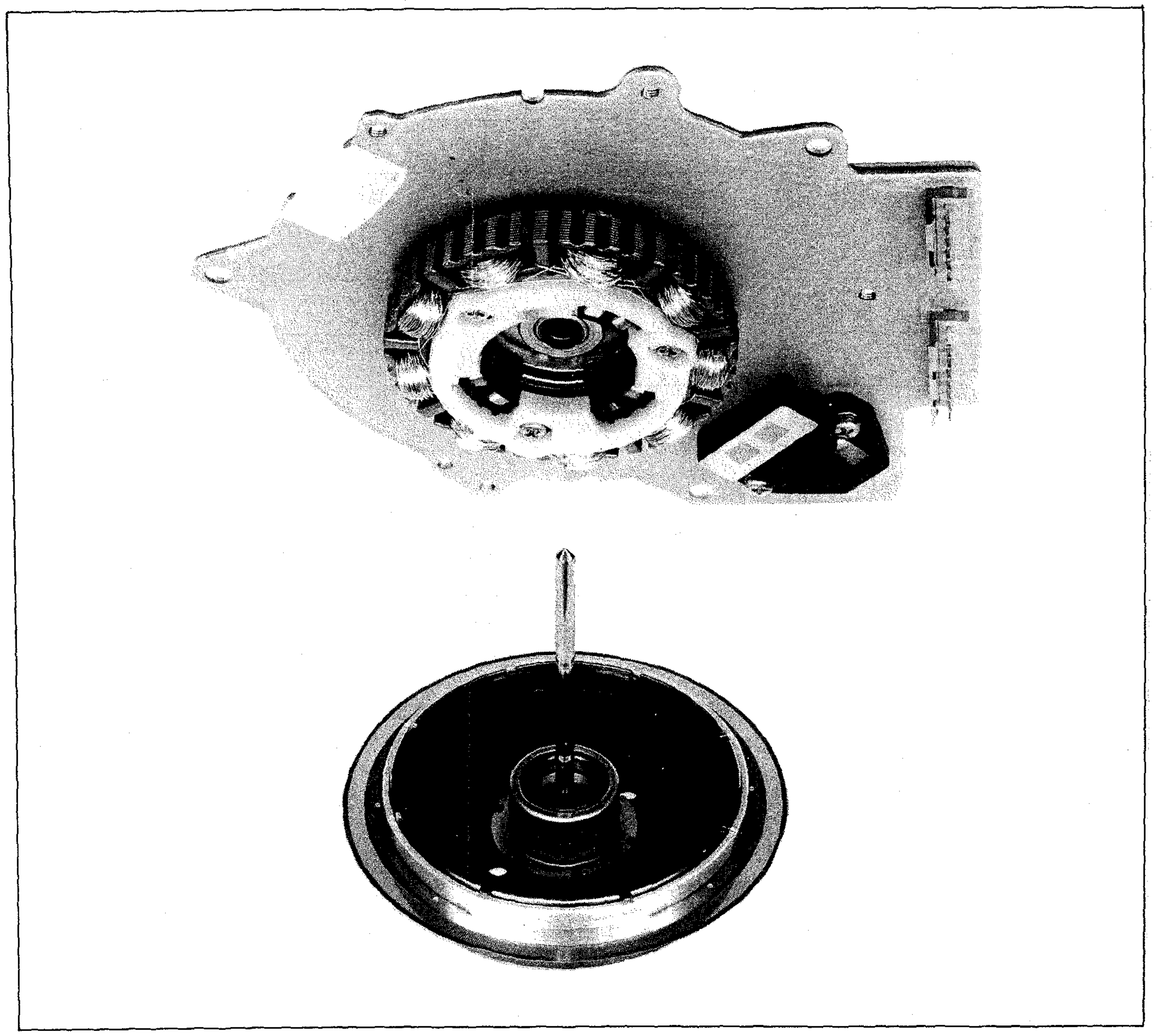


Figure 3-46. Internal Construction of Capstan Motor.

(CASE 1)

When the capstan motor rotates in the reverse direction, the phase of FG1 signal is advanced against the FG2 signal.

(CASE 2)

When the capstan motor rotates in the forward direction, the phase of FG2 signal is advanced against the FG signal.
When the phase relationship between FG1 and FG2 has changed from CASE 1 to CASE 2, it is judged that the capstan motor has stopped. The FG1 and FG2 signals from the capstan motor are supplied to the comparators inside IC2013. The FG signals from the capstan motor are sinewave signal and they are converted to the rectangular waveform shown in Figure 3-47.
These square waves are then applied to the D-type latch and either a REV (L) or a FWD (H) signal is produced.

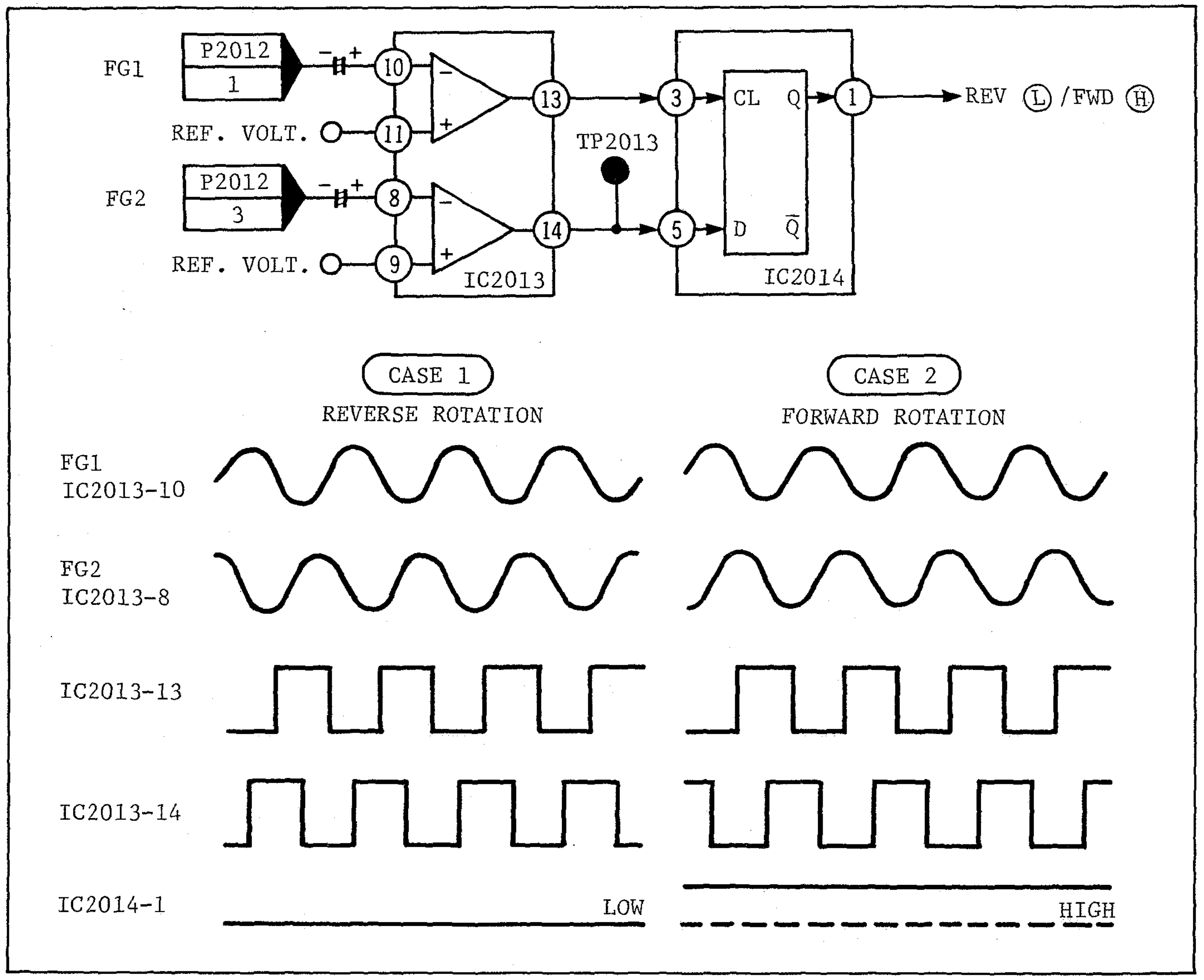

FG1
P2012
1
REF. VOLT.
FG2
P2012
3
REF. VOLT.
10
11
8
9
13
14
IC2013
TP2013
3
5
CL
Q
D
Q̄
1
IC2014
REV Ⓛ/FWD Ⓗ
CASE 1
REVERSE ROTATION
CASE 2
FORWARD ROTATION
FG1
IC2013-10
FG2
IC2013-8
IC2013-13
IC2013-14
IC2014-1
LOW
HIGH

Figure 3-47. Capstan FG and Detection of Rotary Direction.

MICROCOMPUTER CONTROLLED SEARCH CIRCUIT

(1) MICROCOMPUTER μPD1511AC

The AG-6800 has several microcomputers which are linked to each other by serial data transmission for controlling all of the unit functions. (Please refer to the SYSTEM CONTROL section for more detailed descriptions of the serial data transmission.)
Two microcomputers Servo Microcomputer 1 μPD1511AC041 (IC2007) and Servo Microcomputer 2 μPD1511AC025 (IC2006) control the servo circuit. The suffix difference in their type number indicates the different stored programs.
IC2007 handles the serial data transmission for the servo system, and IC2006 manages the functions for the production of the slow and still picture.
Figure 3-48 shows the pins configuration of μPD1511AC and Figures 3-49 and 3-50 list the input and output signals at each pin for the two microcomputers.

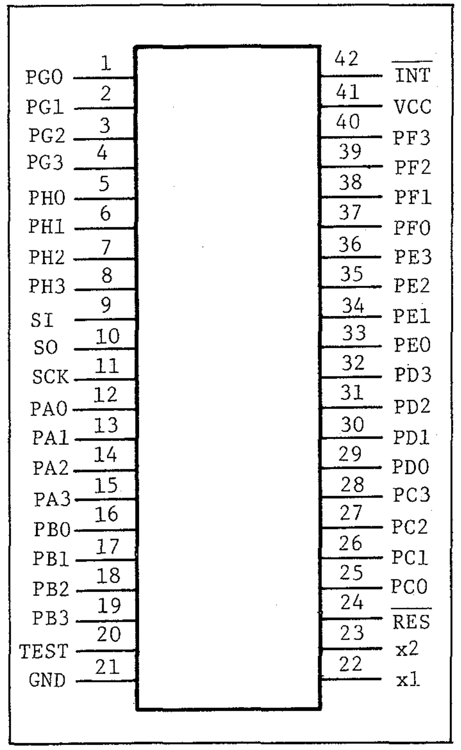


Figure 3-48. Pins Configuration.

PIN NO.	NAME	I/O	OPERATION
1	PG0	OUTPUT	BRAKE (L)
2	PG1	OUTPUT	REEL MOTOR CONTROL
3	PG2	OUTPUT	H SWAY PHASE
4	PG3	OUTPUT	FINE SLOW (H)
5	PH0	OUTPUT	V SWAY FWD
6	PH1	—	—
7	PH2	OUTPUT	ENVELOPE SELECT SS (H)
8	PH3	OUTPUT	ROTARY
9	SI	—	—
10	SO	—	—
11	SCK	—	—
12	PA0	INPUT	FWD/REV CONTROL
13	PA1	INPUT	FWD/REV STATUS
14	PA2	INPUT	SLOW TRACKING
15	PA3	INPUT	1/2 VSS IN
16	PB0	INPUT	PAUSE
17	PB1	INPUT	SLOW 0
18	PB2	INPUT	SLOW 1
19	PB3	INPUT	1/2 SPEED
20	TEST	—	—
21	GND	INPUT	POWER SOURCE (GND)
22	X1	INPUT	CRYSTAL OSC IN (3.58MHz)
23	X2		
24	RESET	INPUT	RESET (L)
25	PC0	—	—
26	PC1	INPUT	AD + (H)
27	PC2	INPUT	HEAD SW PULSE IN
28	PC3	—	—
29	PD0	INPUT	SPEED 0
30	PD1	INPUT	SPEED 1
31	PD2	INPUT	SPEED 2
32	PD3	INPUT	SPEED 3
33	PE0	OUTPUT	CAP ON (L)
34	PE1	OUTPUT	CAP BRAKE
35	PE2	OUTPUT	BRAKE CURRENT SELECT
36	PE3	OUTPUT	SLOW TRACKING OUT
37	PF0	OUTPUT	H SWAY + FWD
38	PF1	OUTPUT	H SWAY - FWD
39	PF2	—	—
40	PF3	—	—
41	VCC	INPUT	POWER SOURCE (+5V)
42	INT	INPUT	CTL (L)

Figure 3-49. IC2006, μPD1511AC025 I/O List.

PIN NO.	NAME	I/O	OPERATION
1	PG0	OUTPUT	REV (H)
2	PG1	OUTPUT	—
3	PG2	OUTPUT	CTL ON (H)
4	PG3	OUTPUT	PAUSE (H)
5	PH0	OUTPUT	SERIAL CONTROL
6	PH1	—	—
7	PH2	OUTPUT	AD +
8	PH3	OUTPUT	FWD (H)
9	SI	INPUT	SERIAL DATA INPUT
10	SO	OUTPUT	SERIAL DATA OUTPUT
11	SCK	INPUT/ OUTPUT	SERIAL CLOCK
12	PA0	INPUT	ADDRESS (L)
13	PA1	INPUT	CAP LOCK (HEAD SW)
14	PA2	INPUT	CAP LOCK (FG)
15	PA3	INPUT	(H) AG-6300
16	PB0	OUTPUT	ROTARY SS (H)
17	PB1	OUTPUT	ROTARY SS (L)
18	PB2	OUTPUT	NOR (H)
19	PB3	—	—
20	TEST	—	—
21	GND	INPUT	POWER SOURCE (GND)
22	X1	INPUT	CRYSTAL OSC IN (3.58MHz)
23	X2		
24	RESET	INPUT	RESET (L)
25	PC0	OUTPUT	R/P (H)
26	PC1	OUTPUT	R/P (L)
27	PC2	OUTPUT	NORMAL,x1/2∿10
28	PC3	OUTPUT	CTL OFF
29	PD0	OUTPUT	FWD x6, x10 (H)
30	PD1	OUTPUT	REV x6, x10 (H)
31	PD2	OUTPUT	GAIN CONTROL
32	PD3	—	—
33	PE0	OUTPUT	SPEED 0
34	PE1	OUTPUT	SPEED 1
35	PE2	OUTPUT	SPEED 2
36	PE3	OUTPUT	SPEED 3
37	PF0	OUTPUT	SLOW 0
38	PF1	OUTPUT	SLOW 1
39	PF2	OUTPUT	1/2 SPEED
40	PF3	OUTPUT	INT
41	VCC	INPUT	POWER SOURCE (+5V)
42	INT	INPUT	INTERRUPT REQUEST (L)

Figure 3-50. IC2007,μPD1511AC041 I/O List.

(2) SEARCH MODE SPEED DATA TRANSMISSION

The variable speed playback (search playback) is performed by three integrated circuits, IC2004, 2006, 2007 which are interconnected as shown in Figure 3-51.

Figure 3-52 shows the search speed output codes of IC2007. Note that normal and multiple speed codes are specified by the 4 speed bits SP0-SP3, and the reverse bit REV (H). The output codes for 1/25 ∿ 1/5 do not use the bits SP0-SP3, but use instead the 2 slow bits SLOW0, SLOW1 together with serial data from Servo Microcomputer 2, IC2006.

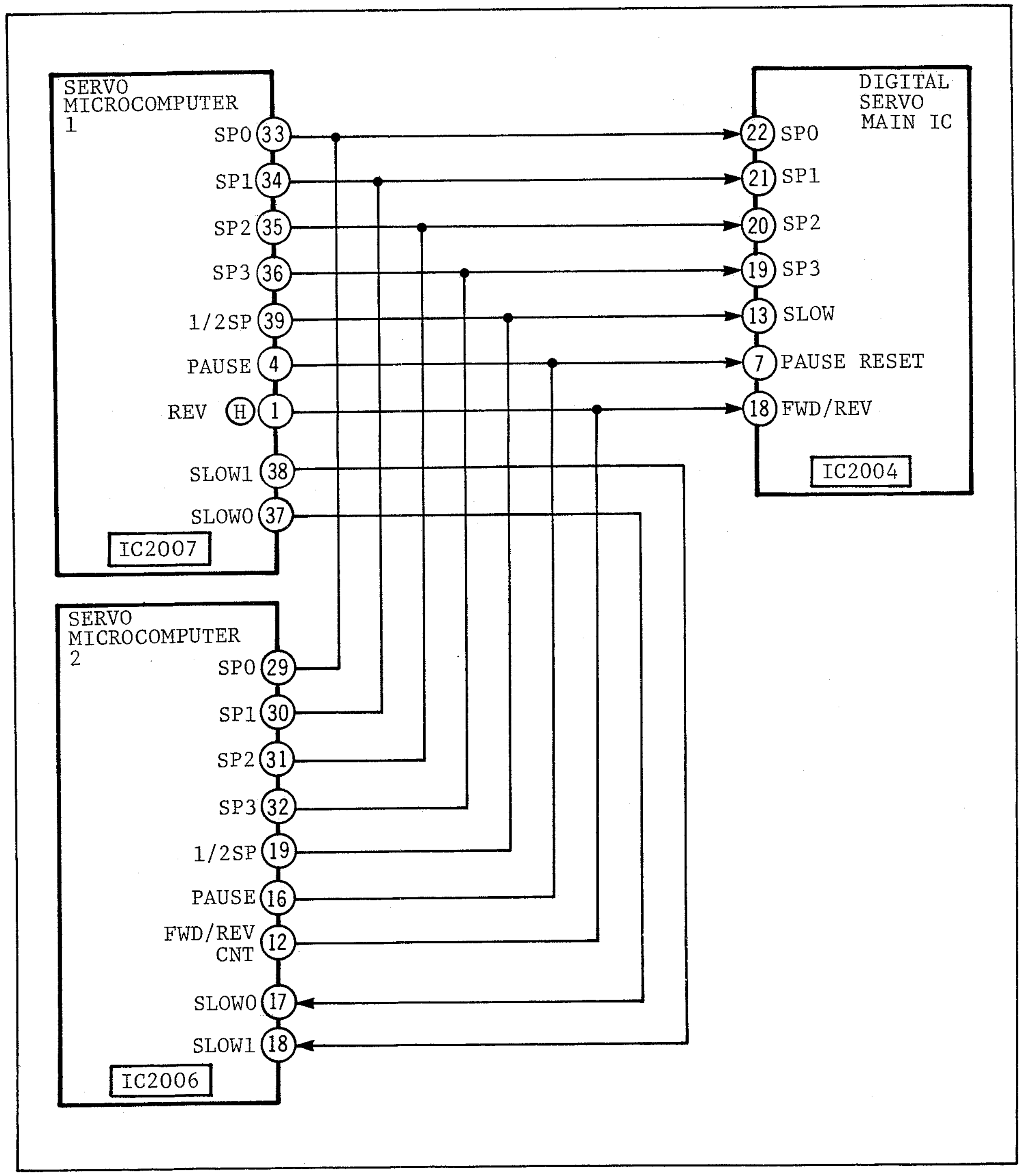

SERVO MICROCOMPUTER 1
SP0 33
SP1 34
SP2 35
SP3 36
1/2SP 39
PAUSE 4
REV Ⓗ 1
SLOW1 38
SLOW0 37
IC2007
DIGITAL SERVO MAIN IC
22 SP0
21 SP1
20 SP2
19 SP3
13 SLOW
7 PAUSE RESET
18 FWD/REV
IC2004
SERVO MICROCOMPUTER 2
SP0 29
SP1 30
SP2 31
SP3 32
1/2SP 19
PAUSE 16
FWD/REV CNT 12
SLOW0 17
SLOW1 18
IC2006

Figure 3-51. Search Mode Speed Data Transmission.

Name / Pin No. / Mode		SP0	SP1	SP2	SP3	1/2SP	PAUSE	REV Ⓗ	SLOW0	SLOW1
		33	34	35	36	39	4	1	37	38
FWD	x10	0	1	0	1	0	0	0	0	0
	x6	0	1	1	0	0	0	0	0	0
	x2	0	1	0	0	0	0	0	0	0
	x1	1	0	0	0	0	0	0	0	0
	x1/2	1	0	0	0	1	0	0	0	0
	x1/5	0	0	0	0	0	0	0	1	1
	x1/10	0	0	0	0	0	0	0	0	1
	x1/25	0	0	0	0	0	0	0	1	0
PAUSE		0	0	0	0	0	1	0	0	0
REV	x1/2	1	0	0	0	1	0	1	0	0
	x1	0	0	0	0	0	0	1	0	0
	x2	0	1	0	0	0	0	1	0	0
	x6	0	1	1	0	0	0	1	0	0
	x10	0	1	0	1	0	0	1	0	0

NOTE: "1" means "High Ⓗ" or +5V (Vcc) status.
"0" means "Low Ⓛ" or 0V (GND) status.

Figure 3-52. IC2007 Search Speed Output Codes.

(3) 1/5 SLOW MODE

When the 1/5 slow mode is selected by using AG-A600, the main microcomputer on the System Control circuit outputs the code for 1/5 slow playback mode. The Servo Microcomputer 1 receives this code by serial data transmission, decodes it, and then supplies the 2 bit slow code to IC2006.

Refer to the timing chart of Figure 3-53 for the description which follows. The Head Switching Pulse is supplied to pin 27 of IC2006. After 25msec. from the falling edge of the switching pulse, the Capstan Motor "ON" signal at pin 33 goes low.

While the Capstan Motor ON signal is high, the high signal is applied to the switching transistor Q25, turning it ON, adding resistor R99 to the current feedback circuit to decrease the total resistance. This results in low current feedback gain and thus prevents the Capstan Motor from rotating.

When the Capstan Motor ON signal goes low, Q25 turns OFF and the current feedback gain increases. The Capstan Motor then starts to rotate and accelerates. When the capstan speed reaches approximately 85% of normal playback speed, the capstan drive decreases to keep the speed constant. At this time, the Capstan Speed Comparator operates to control the Capstan Motor speed.

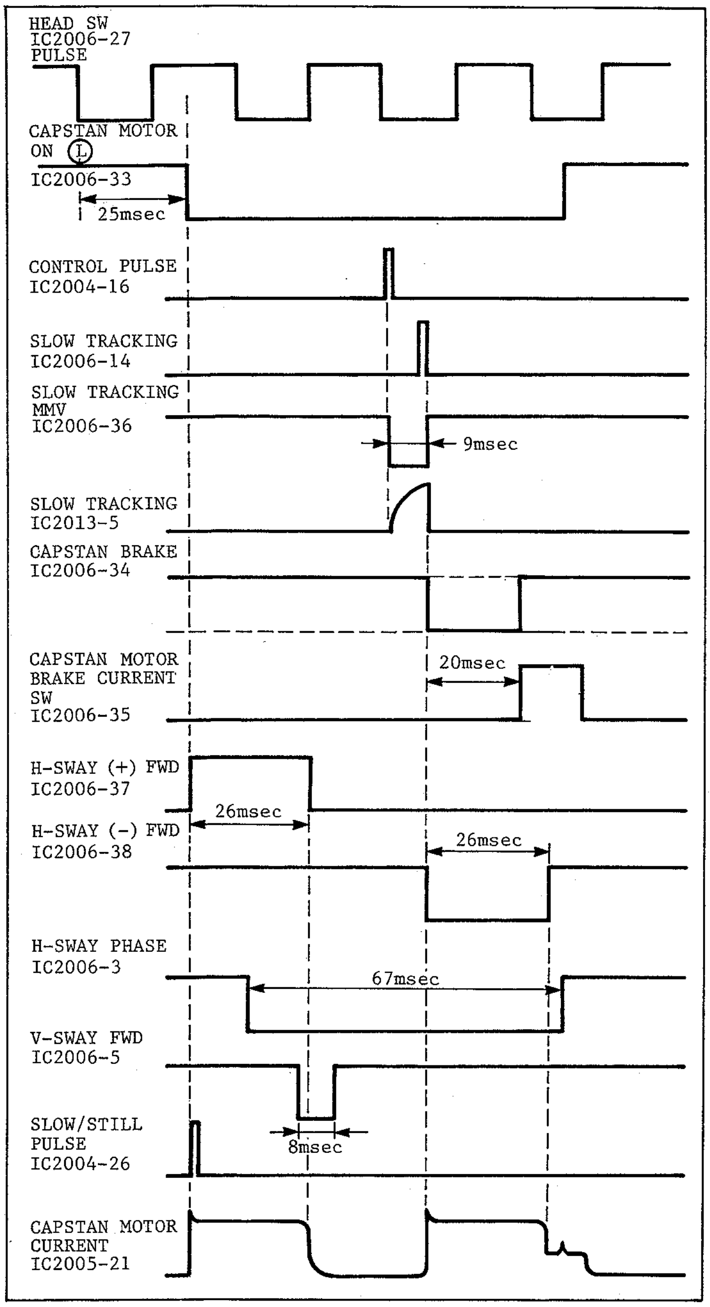

HEAD SW
IC2006-27
PULSE
CAPSTAN MOTOR
ON Ⓛ
IC2006-33
25msec
CONTROL PULSE
IC2004-16
SLOW TRACKING
IC2006-14
SLOW TRACKING
MMV
IC2006-36
9msec
SLOW TRACKING
IC2013-5
CAPSTAN BRAKE
IC2006-34
CAPSTAN MOTOR
BRAKE CURRENT
SW
IC2006-35
20msec
H-SWAY (+) FWD
IC2006-37
26msec
H-SWAY (-) FWD
IC2006-38
26msec
H-SWAY PHASE
IC2006-3
67msec
V-SWAY FWD
IC2006-5
SLOW/STILL
PULSE
IC2004-26
8msec
CAPSTAN MOTOR
CURRENT
IC2005-21

Figure 3-53. 1/5 Slow Timing

During this time, the Control Pulse frequency is not correct. Therefore, the Capstan Phase Comparator is disabled, and a fixed 2.5VDC is applied at the output of the comparator by the ON transistor Q3. When the capstan motor comes up to speed, the control pulse (Positive) is picked up, and is fed to pin 14 of IC2006. The output from pin 36 of IC2006 is reset by the falling edge of the control pulse from pin 14 of IC2006.

When the Servo Microcomputer 2 (IC2006) receives a high signal at pin 14, the output from pin 34 goes low, and is applied to the Capstan Motor Drive circuit to determine the Capstan Brake ON timing as follows. The low signal is applied to the base of Q36, turning it off, pin 7 of IC2005 connects to ground via R163, and the voltage at pin 7 of IC2005 is high. When the High signal is supplied to the FWD/REV DETECTOR, the position coil signal is inverted inside IC2005, and the switching sequence of main coil current flow is changed, producing a reverse direction torque that is used as the brake signal. The Capstan Motor speed thus decelerates.

When the Capstan Motor speed is almost zero, the brake torque must be decreased to prevent the Capstan Motor from rotating in the reverse direction.

After 20msec from the Capstan Brake ON, the low signal at pin 34 of IC2006 goes high and is sent to the servo circuit to control the brake current.

At this time, the Capstan Motor stops and starts to rotate in the reverse direction which is immediately detected by the microcomputer. However, the reset of the Capstan Motor ON signal is delayed about 3msec. The delay is needed because the Capstan Motor has just rotated in the forward direction slightly, and the 3msec is used to return to the actual stop point.

After 5 fields, the same process will be repeated.

(4) REEL MOTOR DRIVE PULSE

The reel motor control pulse is produced at pin 2 of IC2006. The relationship between the capstan motor speed and the reel motor drive pulse is shown in Figure 3-54.
Then, this reel motor control pulse is applied to the reel motor control circuit of the SYSTEM CONTROL

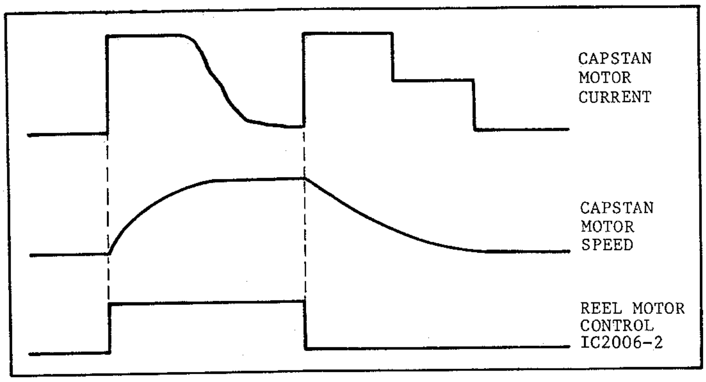


Figure 3-54. Reel Motor Drive Timing.

(5) VERTICAL JITTER CANCEL PULSE

The tape speed is not constant while the tape is moving, the relationship between the head spin and recorded tracks is not steady. Because of this, artificial vertical sync is added to the outgoing video signal in the search modes. To compensate for the jitter in the phase of the artificial vertical sync, the V-lock control signal or vertical jitter cancel pulse is produced which is sent to the artificial vertical sync pulse circuit to shift the sync pulse phase.

(6) HORIZONTAL SWAY CANCEL PULSE

In the Slow mode, the relative head to tape speed increases. The horizontal sync frequency is then slightly changed, and this may result in horizontal jitter on a TV screen. To reduce the jitter, the horizontal jitter cancel pulse is produced. The relationship between the horizontal sway (or jitter) cancel pulse and the capstan motor current is shown in Figure 3-54. The relative head to tape speed variation is derived from the capstan motor rotation speed difference in the Slow mode.

To compensate for the relative head to tape speed variation, the cylinder motor rotation is slightly reduced by mixing the horizontal sway cancel signal with the cylinder servo circuit output, and the mixed signal is then sent to the cylinder motor drive circuit.
In addition to the compensation for Cylinder Motor speed, the Cylinder phase must also be compensated. Phase compensation is performed by the horizontal sway cancel phase signal applied to pin 26 of IC2004. (Refer to Figure 3-53.)

(7) ARTIFICIAL V SYNC GENERATOR

The head switching pulse 30Hz (A) is applied to the differenciated circuits C2084/R2198 and C2085/R2199. The bipolar pulse (B) is produced by C2084 and R2198, and the negative pulse, which is synchronized to the falling edge of the head switching pulse produces the positive pulse at the collector of Q2050. The bipolar pulse (C) is produced by C2085 and R2199 and the positive pulse is passed by D2024. Therefore, the positive pulse which is synchronized to the rising edge of the head switching pulse is mixed with the positive pulse at the collector of Q2050. The positive pulses of waveform (D) is shaped by the inverter Q2051 and the inverted pulse waveform (E) is produced. This pulse triggers the monostable multi-vibrator (MMV1), IC2014 which is set to 0.4msec MMV in the Slow Forward mode. The MMV1 output signal (F) is next fed to the MMV2 (set to 0.5msec MMV.) Therefore, the artificial V pulse is delayed 0.44msec from the falling and rising edges of the head switching pulse, and its pulse width is 0.5msec.

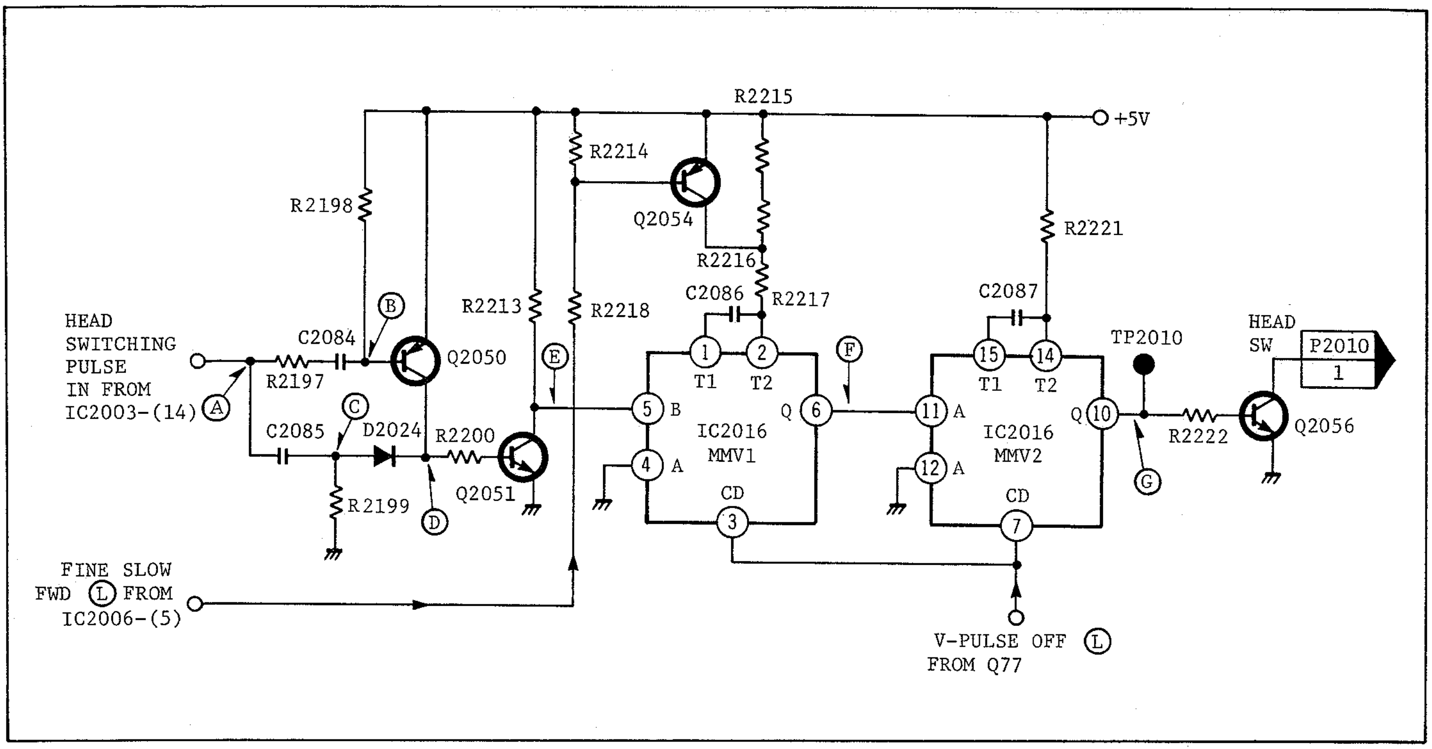

R2215
+5V
R2214
Q2054
R2198
R2221
R2216
C2086
R2217
C2087
R2213
R2218
HEAD SWITCHING PULSE IN FROM IC2003-(14) Ⓐ
C2084
R2197
Ⓑ
Q2050
Ⓔ
Ⓕ
TP2010
HEAD SW
P2010
1
1
2
T1
T2
15
14
T1
T2
5 B
Q 6
11 A
Q 10
IC2016 MMV1
IC2016 MMV2
R2222
Q2056
Ⓒ
C2085
D2024
R2200
Q2051
4 A
12 A
Ⓖ
R2199
Ⓓ
CD
3
CD
7
FINE SLOW FWD Ⓛ FROM IC2006-(5)
V-PULSE OFF Ⓛ FROM Q77

Figure 3-55. Artificial Vertical Sync Generator.

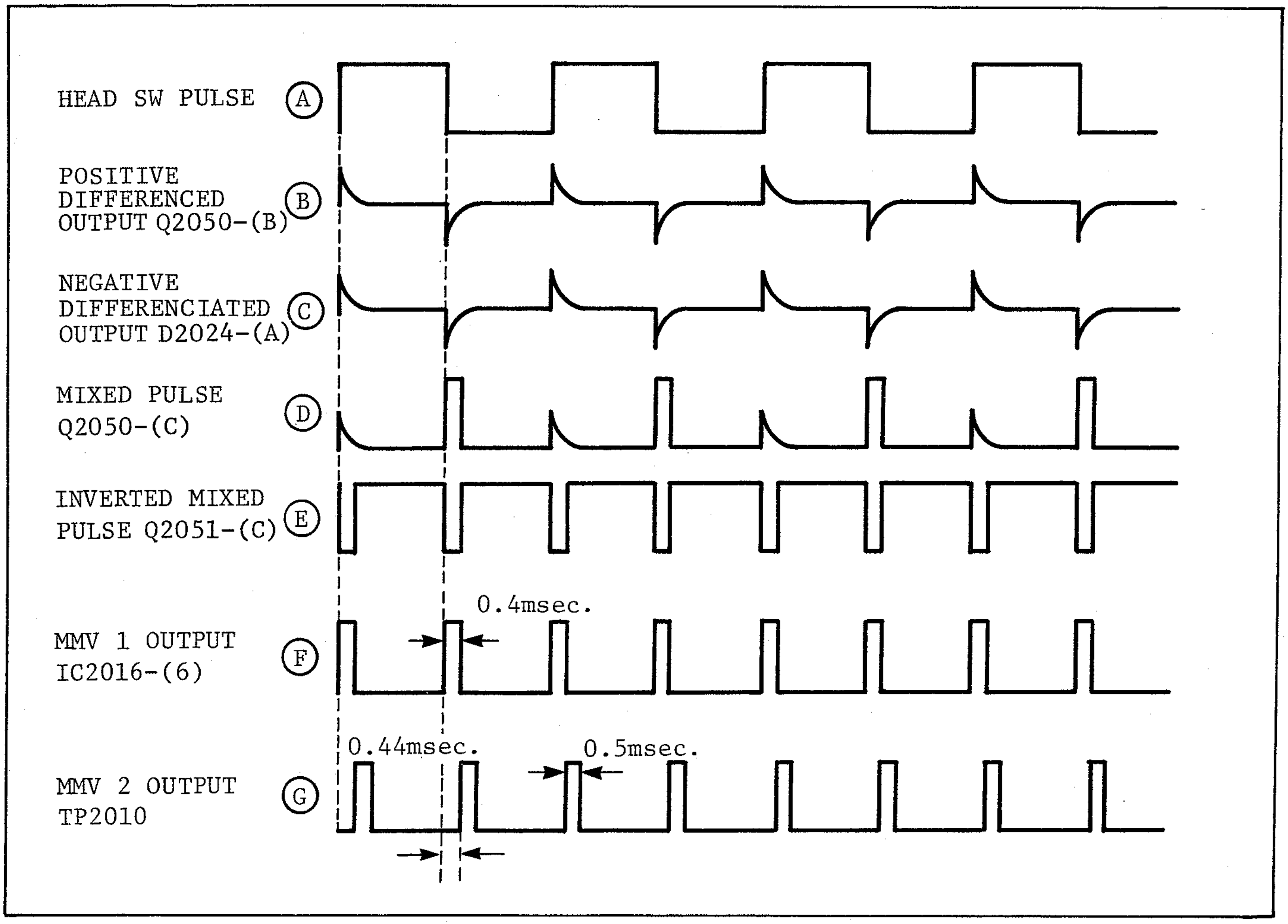

HEAD SW PULSE Ⓐ
POSITIVE DIFFERENCED OUTPUT Q2050-(B) Ⓑ
NEGATIVE DIFFERENCIATED OUTPUT D2024-(A) Ⓒ
MIXED PULSE Q2050-(C) Ⓓ
INVERTED MIXED PULSE Q2051-(C) Ⓔ
0.4msec.
MMV 1 OUTPUT IC2016-(6) Ⓕ
0.44msec.
0.5msec.
MMV 2 OUTPUT TP2010 Ⓖ

Figure 3-56. Artificial V.Sync Producing Timing.

LUMINANCE RECORDING PROCESS

General Description

A simplified block diagram (Figure 4-1) for the Luminance Recording Process is shown below.

LOW PASS FILTER (1)

The video signal is first sent to low pass filter FL1.
FL1 removes any information above 4MHz which is the upper frequency limit to be recorded by the VTR.

AGC

The frequency limited input signal is then sent to an AGC stage inside IC1. The AGC action maintains an overall constant level of the video signal by controlling the gain in the AGC stage. If the level decreases, the AGC amplifier gain increases. The converse is also true.

LOW PASS FILTER (2)

If the video is a color signal, the B/W C switch (inside IC1) will be set to the C position and the level controlled video signal will pass through the low pass filter FL2. The 3MHz cutoff frequency of FL2 removes all color information which is centered around the 3.58MHz color carrier.
In the B/W mode, the switch will be set to the B/W position, and the signal will bypass FL2.

DEVIATION

The low pass filtered video signal must now be controlled in amplitude. It is the amplitude of the signal that determines how far the FM carrier will swing. To make sure that the FM modulators of all units function the same, the amplitude of the low pass filtered signal must be made the same. The amplitude is controlled by the DEVIATION control (R18).

EMPHASIS

Emphasis circuit in IC1 boosts the level of the high frequency portions of the signal. This is the normal pre-emphasis operation used in FM systems to improve signal-to-noise of the high frequencies during playback. Upon playback, these signals will be de-emphasized, which will restore the original characteristics of the signal.

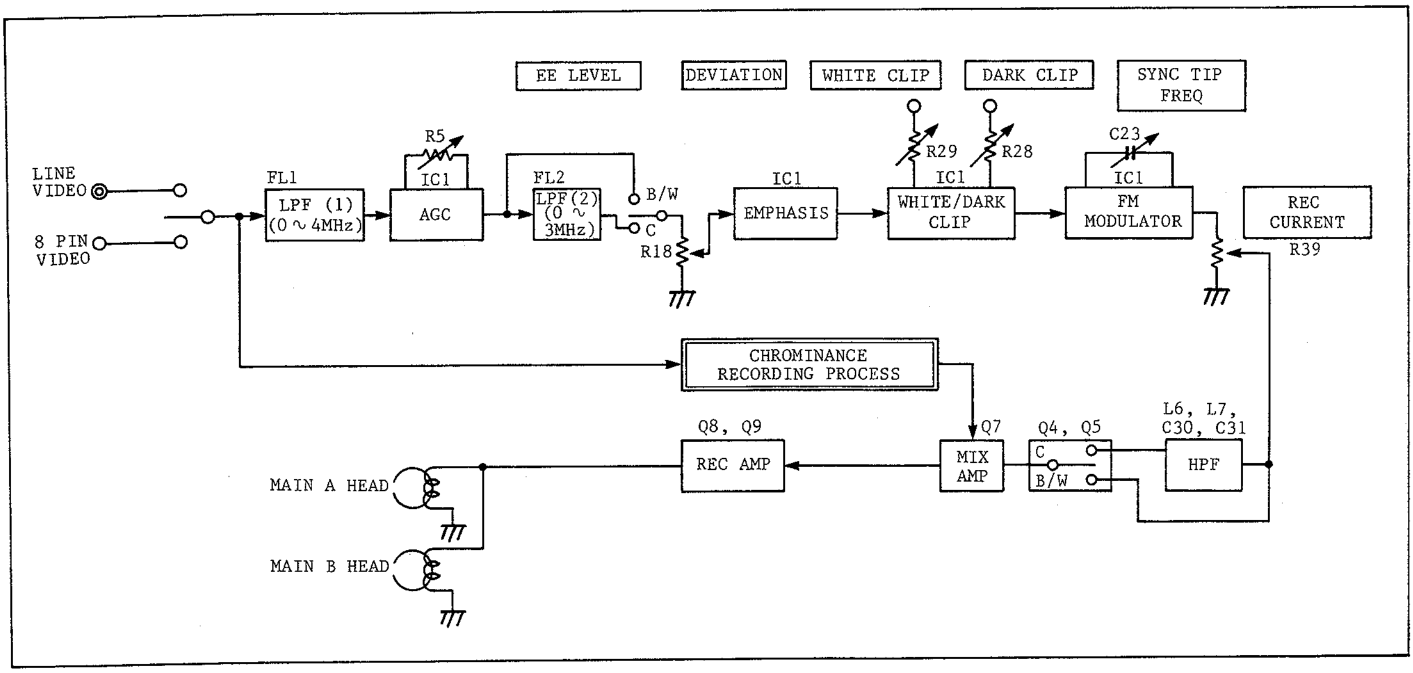

EE LEVEL
DEVIATION
WHITE CLIP
DARK CLIP
SYNC TIP FREQ
R5
R29
R28
C23
LINE VIDEO
8 PIN VIDEO
FL1
LPF (1) (0 ∿ 4MHz)
IC1
AGC
FL2
LPF (2) (0 ∿ 3MHz)
B/W
C
R18
IC1
EMPHASIS
IC1
WHITE/DARK CLIP
IC1
FM MODULATOR
REC CURRENT
R39
CHROMINANCE RECORDING PROCESS
Q8, Q9
REC AMP
Q7
MIX AMP
Q4, Q5
C
B/W
L6, L7, C30, C31
HPF
MAIN A HEAD
MAIN B HEAD

Figure 4-1. Luminance Recording Process Block Diagram.

WHITE CLIP AND DARK CLIP

After the emphasis operation, unwanted overshoots and undershoots appear (see Figure 4-2), due to the boost in the high frequency level. These overshoots and undershoots may cause over-modulation, and therefore are cut off at an adjustable level by CLIP controls R28 and R29 (Figure 4-1).

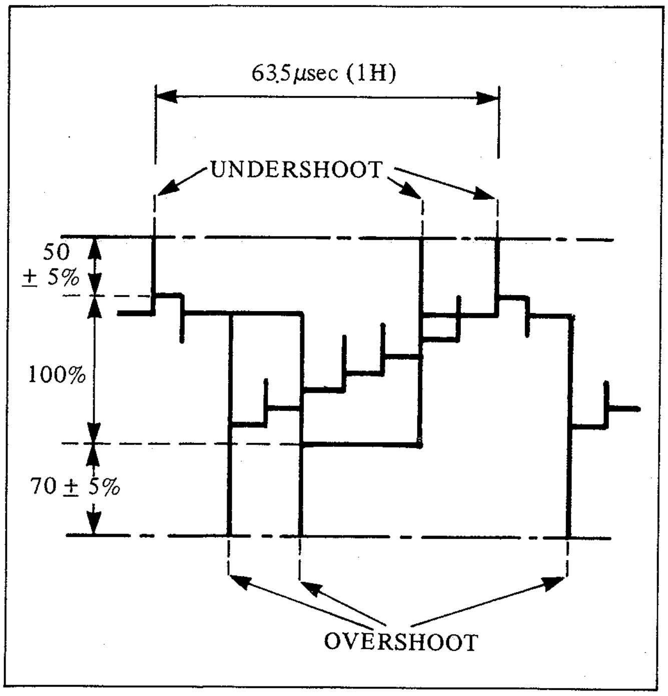

63.5μsec (1H)
UNDERSHOOT
50 ± 5%
100%
70 ± 5%
OVERSHOOT

Figure 4-2. White Clip and Dark Clip.

FM MODULATION

The processed signal is then used to frequency modulate an FM carrier so that the sync tip corresponds to 3.4MHz, and the white peak produces a deviation to 4.4MHz. In addition, upper and lower sidebands are produced.

B/W COLOR SWITCHING OF HIGH PASS FILTER

After FM modulation, the lower side band will extend down to (and below) 629kHz as shown in Figure 4-3.
Since the VHS chroma recording system is a down conversion system with color information centered around 629kHz, it will cause chroma beats during playback if the downconverted chroma recording signal and FM lower sideband are combined. Therefore, when recording color signals, the HPF (shown in Figure 4-1) is switched ON and the FM lower sideband is bandlimited as shown in Figure 4-4.

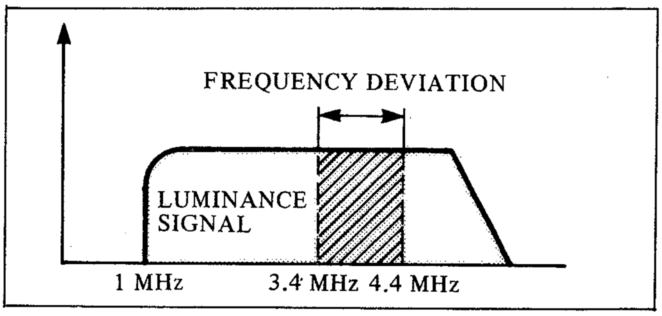

FREQUENCY DEVIATION
LUMINANCE SIGNAL
1 MHz
3.4 MHz
4.4 MHz

Figure 4-4. Spectrum of FM Signal.

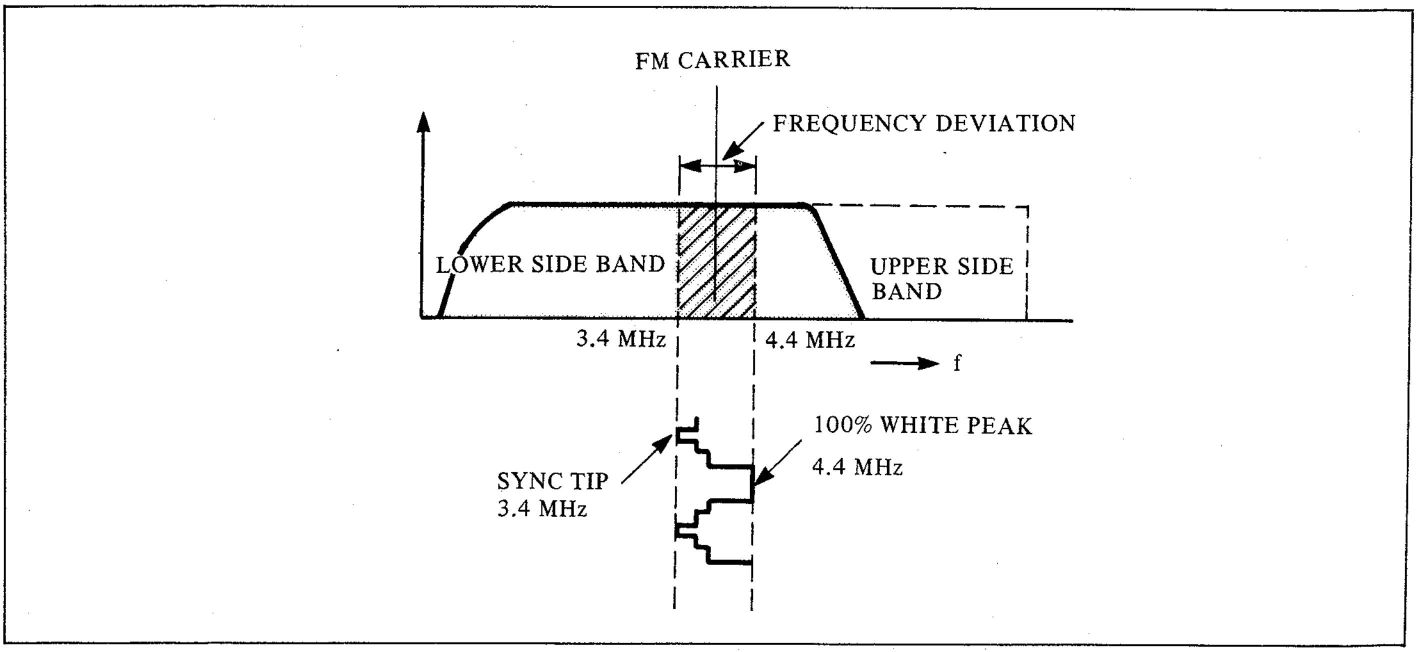

FM CARRIER
FREQUENCY DEVIATION
LOWER SIDE BAND
UPPER SIDE BAND
3.4 MHz
4.4 MHz
f
100% WHITE PEAK
4.4 MHz
SYNC TIP
3.4 MHz

Figure 4-3. FM Modulation.

Detailed Description

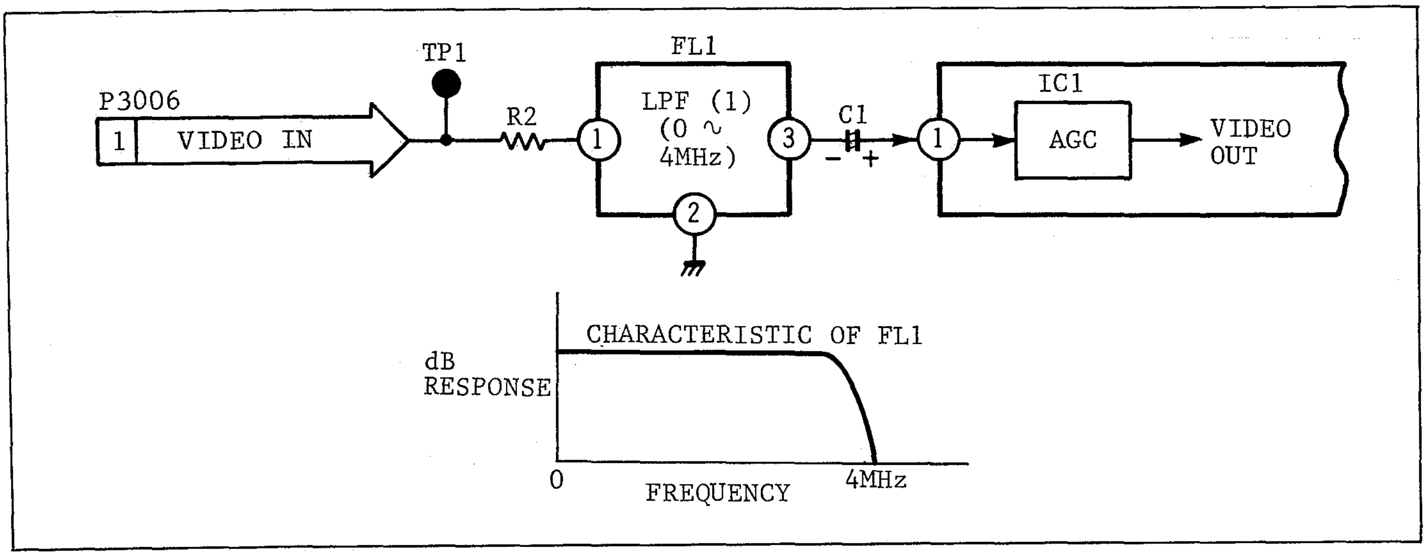

TP1
P3006
1
VIDEO IN
R2
FL1
LPF (1)
(0 ∿ 4MHz)
①
②
③
C1
IC1
AGC
VIDEO OUT
CHARACTERISTIC OF FL1
dB RESPONSE
0
FREQUENCY
4MHz

Figure 4-5. Low Pass Filter (1).

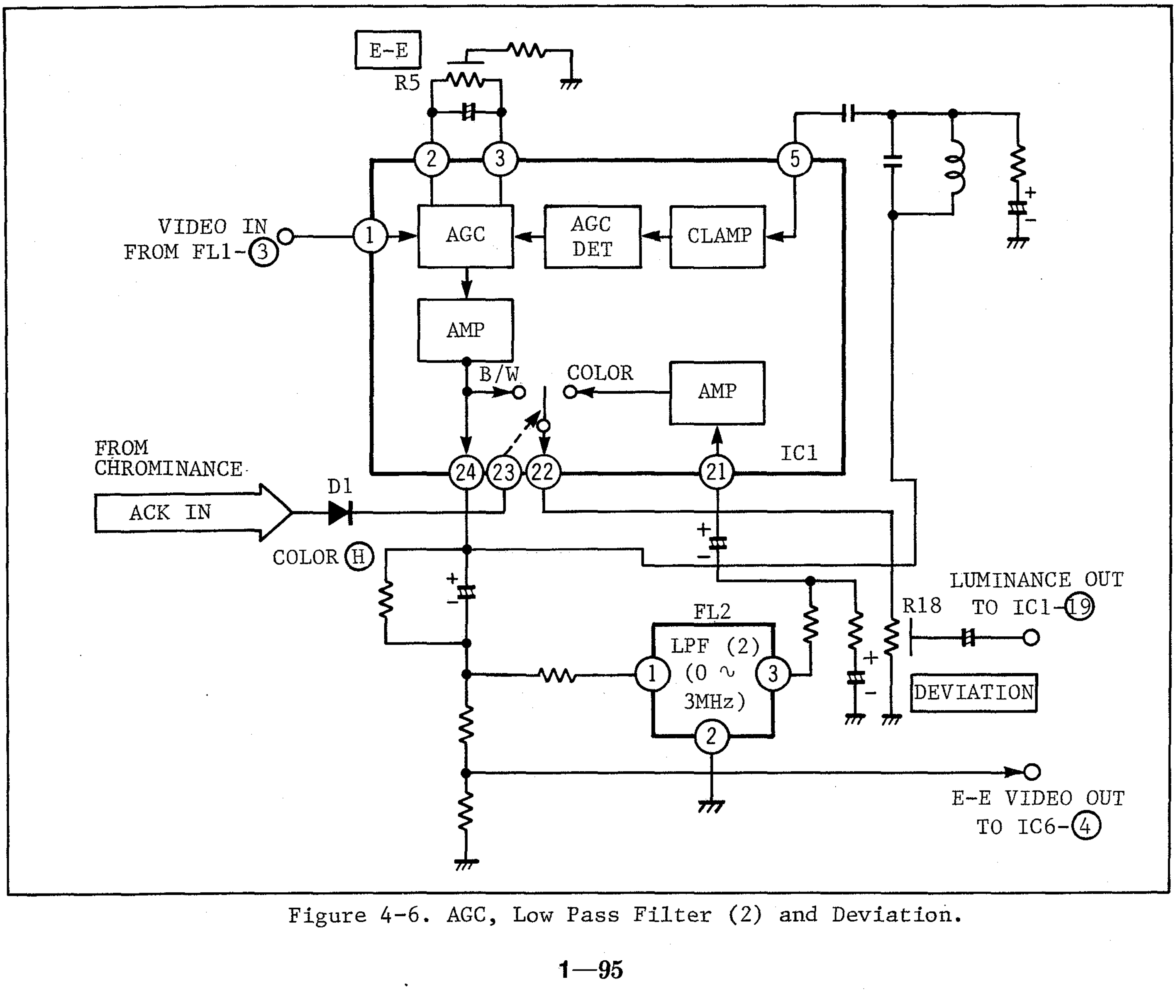

E-E
R5
VIDEO IN FROM FL1-③
AGC
AGC DET
CLAMP
AMP
B/W
COLOR
AMP
IC1
FROM CHROMINANCE
ACK IN
D1
COLOR Ⓗ
FL2
LPF (2)
(0 ∿ 3MHz)
R18
LUMINANCE OUT TO IC1-⑲
DEVIATION
E-E VIDEO OUT TO IC6-④

Figure 4-6. AGC, Low Pass Filter (2) and Deviation.

LOW PASS FILTER (1)

The video signal from pin 1 of connector P3006 enters the Low Pass Filter, FL1 at pin 1 as shown in Figure 4-5.
The filter eliminates any unwanted energy above 4.4MHz, thus allowing only bonafide video signals to pass.

AGC (AUTOMATIC GAIN CONTROL)

The input to the Luminance Record system closely resembles that of the 'E-E' (Electronics-to-Electronics) circuitry because the same circuits are used. The composite video signal is applied to the video recording processing IC1 on the Luminance board.
Inside of IC1, the signal is processed by the AGC and video amplifier stages; as 'E-E', output is via pin 24 of the IC1 from this point the signal follows a different path than in the 'E-E' mode. Referring to Figure 4-6, the video signal present at pin 24 re-enters on pin 5 and is sent to the AGC detector of IC1. This is a keyed AGC circuit which detects the sync amplitude.
If the overall sync level drops, the AGC DETECTOR increases the gain of the AGC AMPLIFIER. The converse is also true. EE LEVEL control (R5) is used to set the gain level of the AGC with a standard input.
This control is adjusted so that the video level at TP19 is 2.0Vp-p, when the standard video signal of 1Vp-p is supplied to the video input.

LOW PASS FILTER (2)

The automatic gain controlled video signal is applied to pin 1 of the low pass filter (FL2). In the color mode, the B/W Color switch in IC1 will be set on the Color position and FL2 is switched in to block the color information. The low pass filtered video signal present at pin 3 of FL2 is fed back to pin 21 of IC1 where it passes through an amplifier before leaving IC1 at pin 22. The characteristic of FL2 is shown in Figure 4-7.

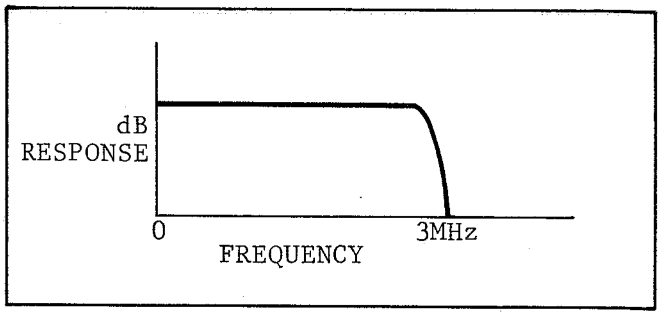


Figure 4-7. Low Pass Filter (2).

DEVIATION

The luminance only signal is adjusted (peak to peak level) for the FM modulation by the DEVIATION control (R18) (shown in Figure 4-6). The control is adjusted so that the level from sync tip to peak white at TP3 is approx. 0.5V which corresponds to a frequency deviation of 1.0MHz.

REGULAR EMPHASIS,
DARK CLIP AND WHITE CLIP

The AGC'd signal is routed through an amplifier between pins 18 and 19, buffered by Q2 and fed back to the clamp and emphasis circuits through pin 16 (see Figure 4-9).
The clamp stage sets the sync tip to a specific DC level which will correspond to the 3.4MHz FM Carrier.
The output of the clamp stage then enters the pre-emphasis stage where the high frequency signal components are boosted in accordance with the characteristic shown in Figure 4-8.

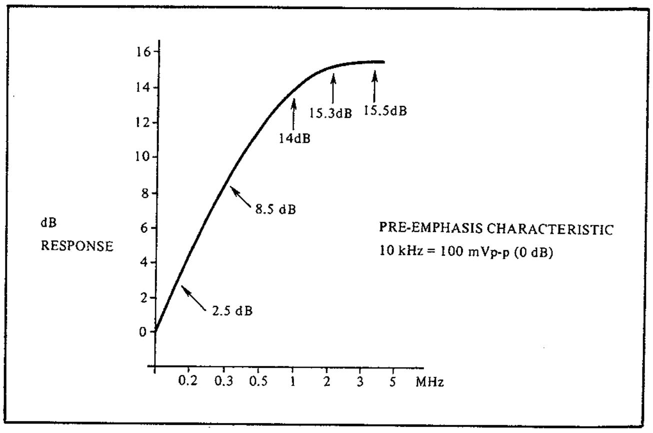


Figure 4-8. Pre-Emphasis Characteristic.

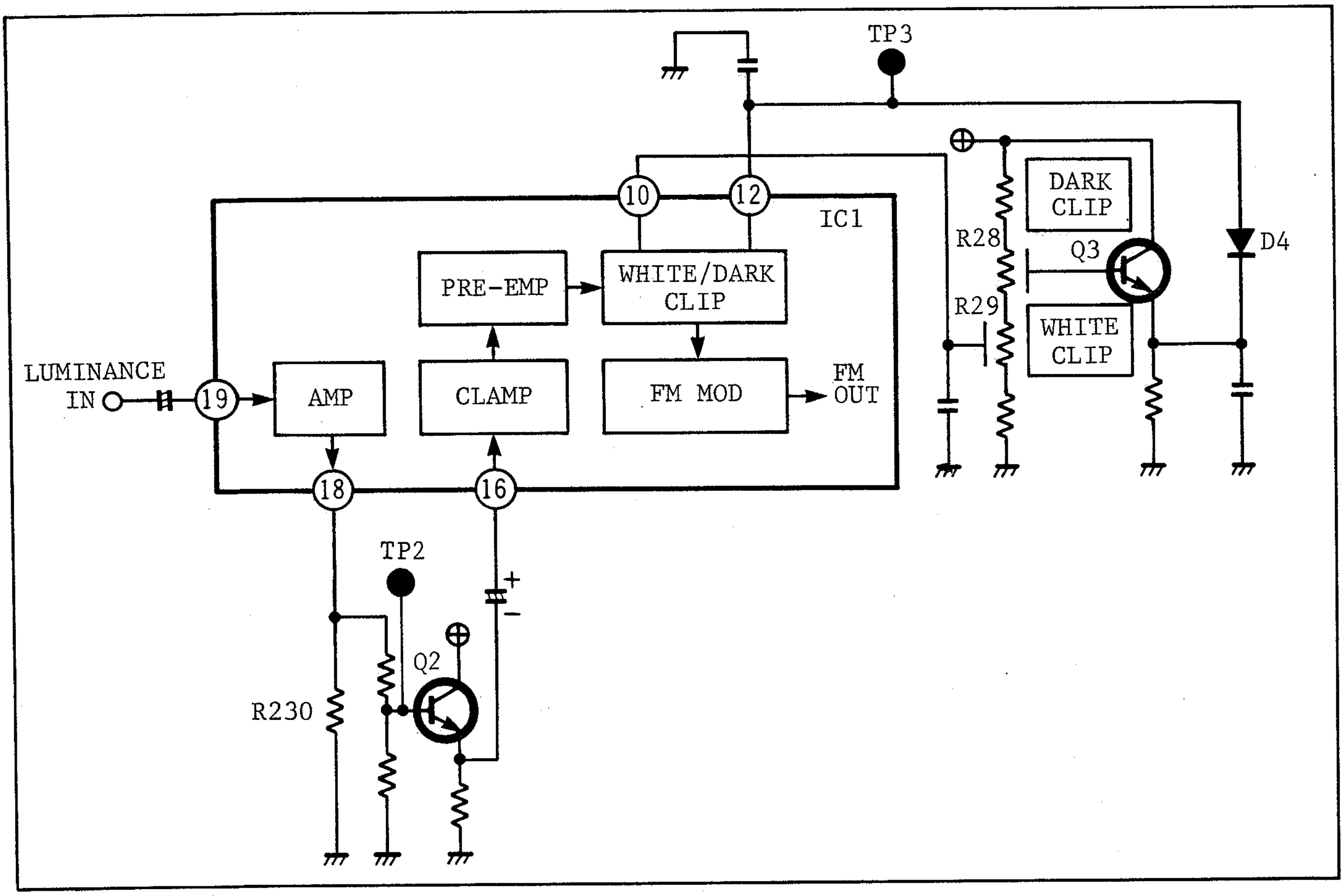

TP3
DARK CLIP
IC1
R28
Q3
D4
PRE-EMP
WHITE/DARK CLIP
R29
WHITE CLIP
LUMINANCE IN
AMP
CLAMP
FM MOD
FM OUT
10
12
19
18
16
TP2
Q2
R230

Figure 4-9. Pre-Emphasis.

After emphasis is performed, any unusually large overshoots and undershoots in the luminance signal are cut off at an adjustable level. This is done to avoid FM over modulation.
The overshoot levels are controlled by the white clip circuit and the undershoot levels are controlled by the dark clip circuit. Refer to Figure 4-9. The DARK CLIP adjustment is performed by R28 and the WHITE CLIP adjustment is performed by R29. The clipped signal may be monitored at TP3. Figure 4-10 gives an example of a clipped video signal at the input to the FM modulator.

FM MODULATOR

The actual device which constitutes the FM modulator is an Astable Multivibrator. This multivibrator generates a square wave output of variable frequency. The frequency of the square wave is governed by the level of the processed video signal at any given moment.

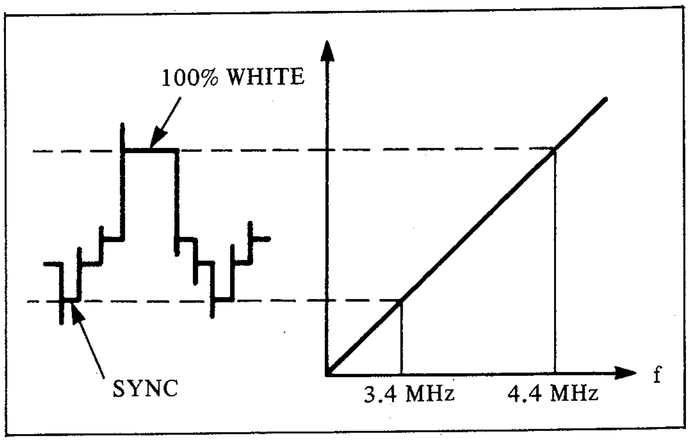


Figure 4-10. Relationship between FM Modulation and White/Dark Clips.

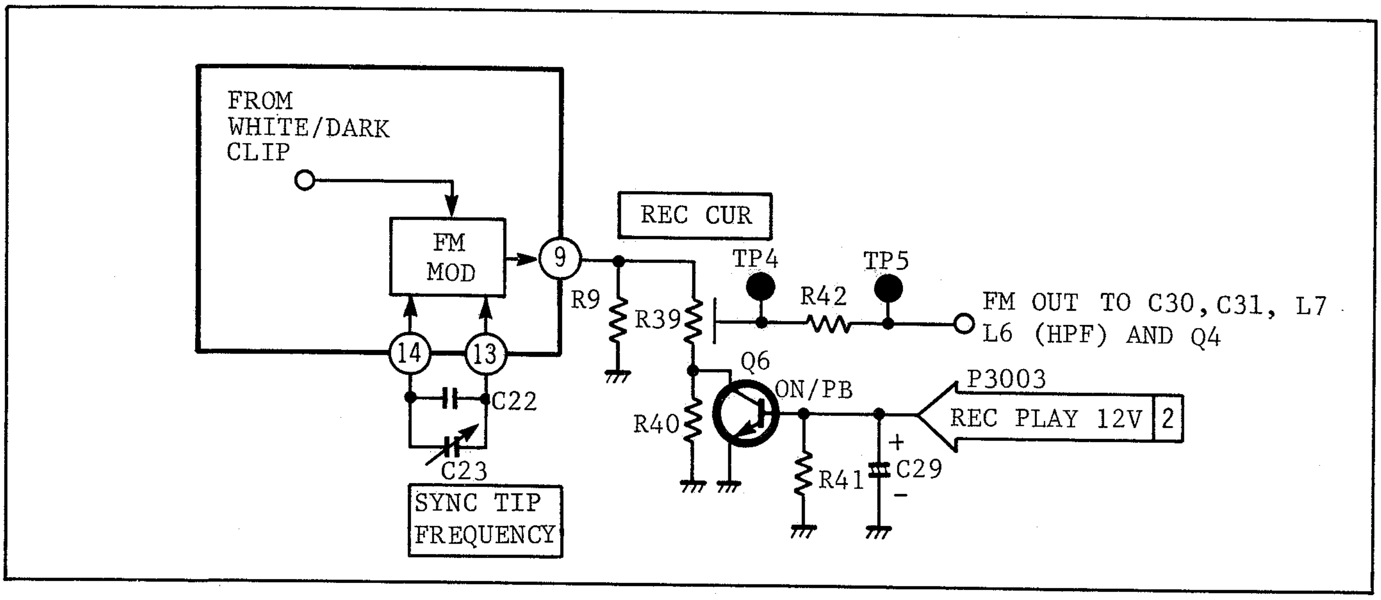


Figure 4-11. FM Modulator.

Therefore, the processed video signal varies the frequency of the square wave, which is frequency modulation, or FM. The free oscillation frequency of this multivibrator is determined by the SYNC TIP FREQUENCY control (C23). See Figure 4-11. This control is adjusted that the frequency of the sync tip of the video signal is 3.4MHz.

RECORD CURRENT SW

This circuit boosts the REC current during the editing play is pause release mode to erase the previous recorded signal completely. This is necessary to eliminate any interference noise at the editing point. In recording mode, the REC PLAY +12V is supplied to the base of Q6 through C29 and R41, so the resistor R40 is shorted through Q6, and R39 is effectively returned to ground (see Figure 4-11). In this case, the level of FM signal is normal.
When the pause key is released in PAUSE/ REC mode, the base of Q6 is kept low for a moment until C29 is full charged. This turns Q6 off, so the REC curr. control R39 is grounded through the resistance of R40 boosting the level of the FM signal.

REC CURRENT ADJUSTMENT

The level of the modulated frequency signal is controlled by the REC CURRENT control (R39), for the most suitable current.

B/W COLOR SWITCHING

When the carrier of the FM modulator swings from 3.4MHz to 4.4MHz, sidebands are also produced. This can be represented on a spectral graph. See Figure 4-12.

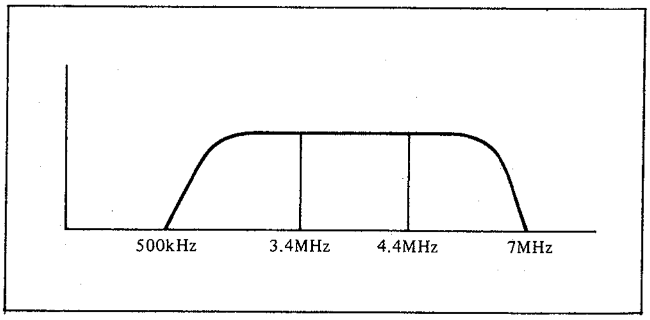


Figure 4-12. FM Signal.

Notice that the lower sideband extends down to (and below) 629kHz.
When recording color signals, the lower FM sideband must be removed.

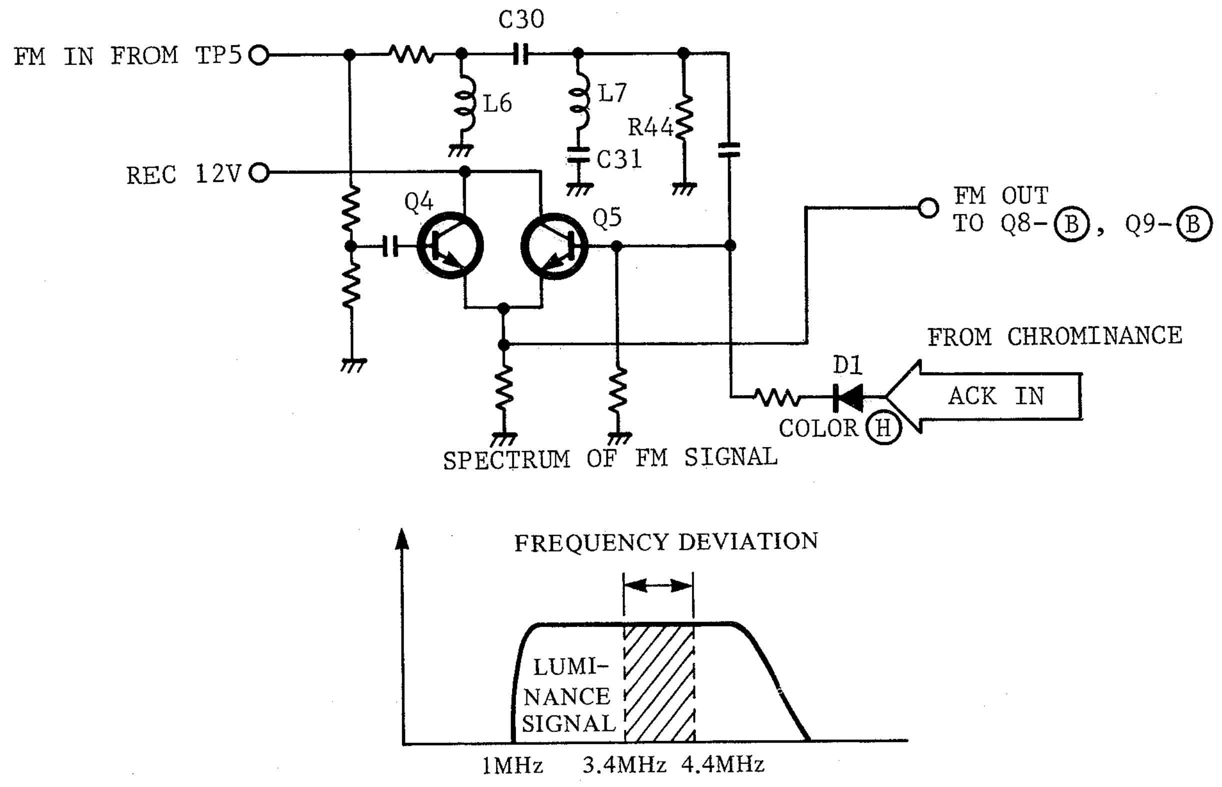

C30
FM IN FROM TP5
L6
L7
R44
C31
REC 12V
Q4
Q5
FM OUT
TO Q8-Ⓑ, Q9-Ⓑ
FROM CHROMINANCE
D1
ACK IN
COLOR Ⓗ
SPECTRUM OF FM SIGNAL
FREQUENCY DEVIATION
LUMI-
NANCE
SIGNAL
1MHz
3.4MHz
4.4MHz

Figure 4-13. B/W, Color Switching.

This is accomplished by a high pass filter consisting of L6, C30, L7, and C31. See Figure 4-13.
In the B/W mode, there is no need to cut off or band limit the FM sidebands.
In the B/W mode, no high signal appears at the base of Q5, so the normal bias applied to Q5 allows Q5 to turn OFF, keeping Q4 ON. Therefore, the unfiltered FM input to Q4 is passed to its emitter and the output.
In the color mode, Q5 receives the High ACK color switching signal at its base. This High signal allows Q5 to be forward biased even harder than Q4, and Q5 turns ON, keeping Q4 OFF.
The FM input is now routed through the high pass filter to the base of Q5, resulting in a high pass filtered output from this stage.

FM COLOR MIXING AND RECORDING AMPLIFIER

Both the FM signal and the 629kHz color signal (from the Chrominance Recording Process circuits) are applied to the tape at the same time, so they must be mixed before the final amplifier. The FM and color signals are mixed at the mixing amplifier Q7. See Figure 4-14. This amplifier's frequency response is not flat. The gain at 1MHz is greater than the gain at 4.4MHz. This is to compensate for certain inherent video head characteristics, especially since the heads were specifically designed to operate above 4.4MHz. The amplifier output signal is supplied to the video heads through amplifier Q8 and Q9.
During the recording mode, Q10 is turned OFF since the PLAY 12V is low, and all signals pass through to the video heads.

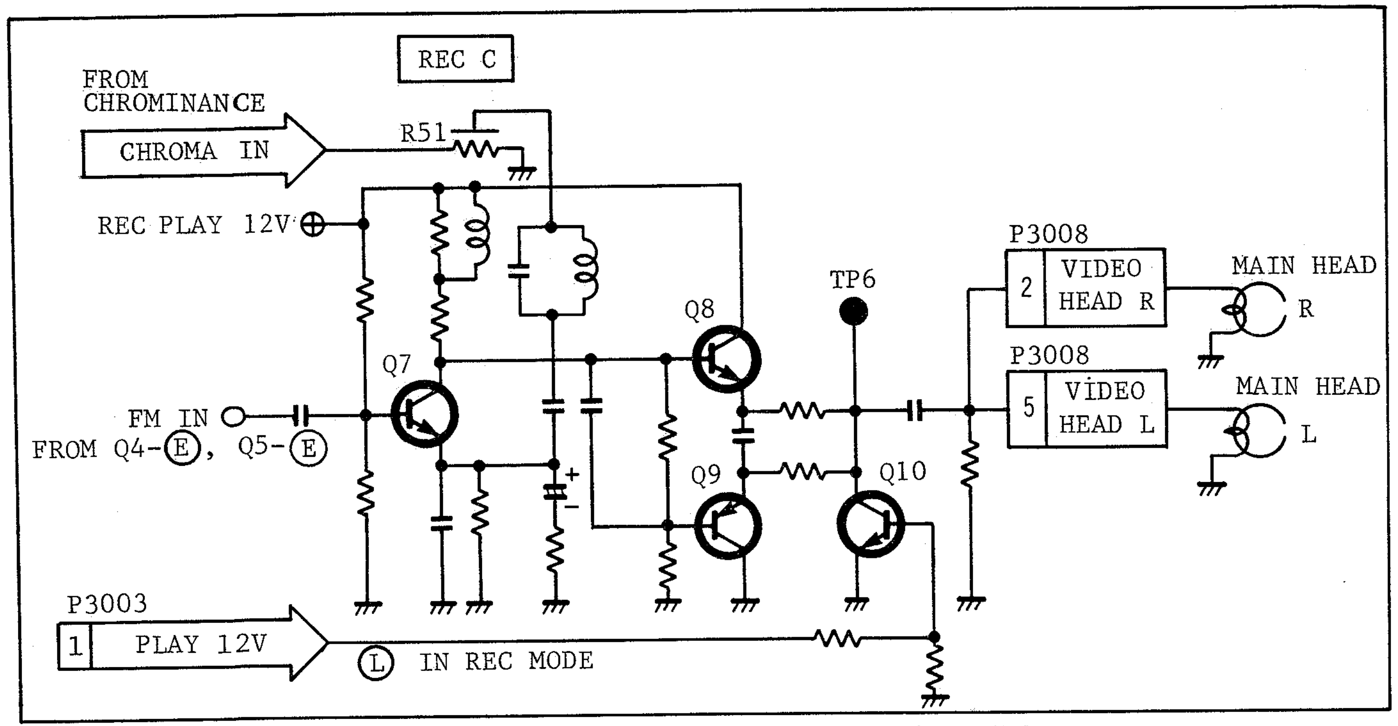

REC C
FROM CHROMINANCE
CHROMA IN
R51
REC PLAY 12V
P3008
2 VIDEO HEAD R
MAIN HEAD R
TP6
Q8
Q7
P3008
5 VIDEO HEAD L
MAIN HEAD L
FM IN
FROM Q4-Ⓔ, Q5-Ⓔ
Q9
Q10
P3003
1 PLAY 12V
Ⓛ IN REC MODE

Figure 4-14. Color Mixing and Recording AMP.

LUMINANCE PLAYBACK PROCESS

General Description

HEAD AMP

The simplified block diagram for the Head Amp process is shown below. (Figure 4-15).

The first process in the playback mode is that of signal recovery off the tape. The video heads spin and sweep across the tape as they deliver a Frequency Modulated Luminance signal and a 629kHz Converted Chrominance signal.

Frequency shaping circuits are used in the Head Amplifiers to provide the required frequency response, and better S/N ratio during playback. The circuits which adjust the frequency response are described in the Detailed Description section.

This model has 6 video heads, one pair is used in NORMAL mode. Two head amplifiers are required for each pair of video heads, because they have different electrical characteristics.

The other pair of Audio heads is used Audio H-Fi record and playback, and dummy heads are used for only smooth tape pass. These heads are not used for Still and Slow playback.

PEAK CONTROL

The main video heads is asked to playback frequencies in excess of 4.4MHz. Not every video head made has the exact same frequency response as any other head, but it is important that the 2 video heads in the unit have as similar a response as possible.

This assumes that each head channel will produce nearly identical signals, which in turn produces the best pictures. Also, the video heads and their respective amplifiers should exhibit a specific frequency response characteristic in order to allow the unit to operate at maximum signal-to-noise ratio, best overall playback response, etc., all within the basic design limitation.

This is why each video head has an adjustable peak frequency--for head matching, and response contouring.

In the explanation which follows, reference is made to the A channel of the Main Head Amp, but the description also applies to each of the other heads.

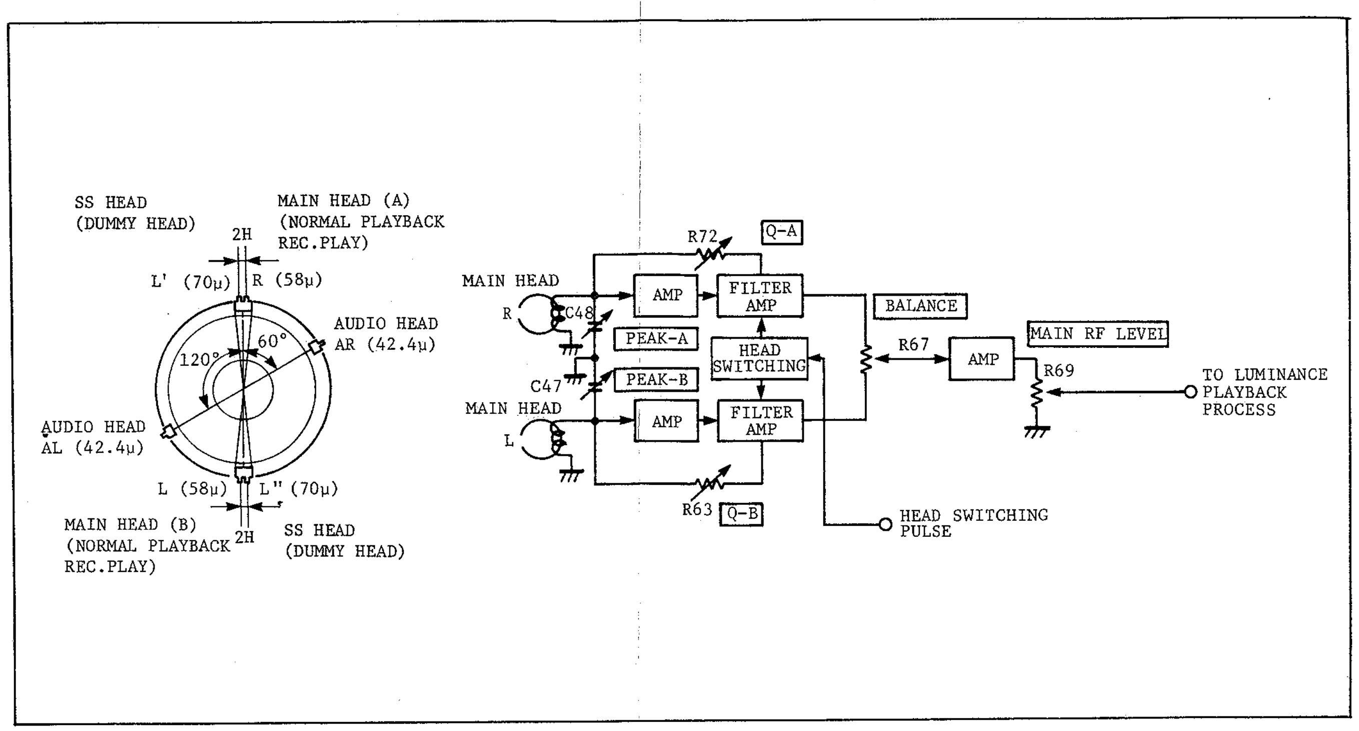

SS HEAD (DUMMY HEAD)
MAIN HEAD (A) (NORMAL PLAYBACK REC.PLAY)
2H
L' (70μ)
R (58μ)
AUDIO HEAD AR (42.4μ)
60°
120°
AUDIO HEAD AL (42.4μ)
L (58μ)
L" (70μ)
MAIN HEAD (B) (NORMAL PLAYBACK REC.PLAY)
2H
SS HEAD (DUMMY HEAD)
MAIN HEAD R
C48
C47
MAIN HEAD L
R72
Q-A
AMP
FILTER AMP
PEAK-A
PEAK-B
HEAD SWITCHING
AMP
FILTER AMP
R63
Q-B
BALANCE
R67
AMP
MAIN RF LEVEL
R69
TO LUMINANCE PLAYBACK PROCESS
HEAD SWITCHING PULSE

Figure 4-15. Head Amp Block Diagram.

The 1st and 2nd amplifiers inside of IC2 are affected by the setting of the peak control C47 which is adjusted so that the output of the video head becomes maximum at 4.5MHz.

Except for reference numbers, an identical circuit is used for the B channel (Main Head Amp) and A channel.

1ST & 2ND AMPLIFIERS

The video heads deliver their signals to their respective playback amplifiers which provide sufficient gain to drive the rest of the tuned circuits. A feedback path from the output of each amp to the input provides a "Q" adjustment.

Q ADJUSTMENT

The Q adjustment changes the shape of the playback frequency response curve in relation to the peak frequency. The Q is adjusted so that the levels of 2MHz and 4.5MHz are balanced.

HEAD SWITCHING

It has been pointed out before that only the video head actually in contact with tape provides output during playback. Because of this, the heads are switched ON and OFF 60 times per second.

Since the head not contacting the tape is picking up noise, the channel for this head is shorted to ground at the amplifier stage to prevent noise in the output signal.

The PG pulse, or head switching pulse, produced by the servo circuits is used for the switching. The pulse is actually a square wave, positive or high for the A head, and zero or low for the B head.

While the A head is off the tape, the low portion of the switching signal shorts the A channel signal to ground.

During this time, the B head is on the tape, and since a low signal would also turn channel B OFF, the switching pulse is inverted before being applied to channel B. In this way, alternate switching is accomplished.

BALANCE ADJUSTMENT

The outputs from the A and B channels are mixed across the fixed resistance leads of a potentiometer.

(Main...R67)

The wiper then selects the balance between the two channels.

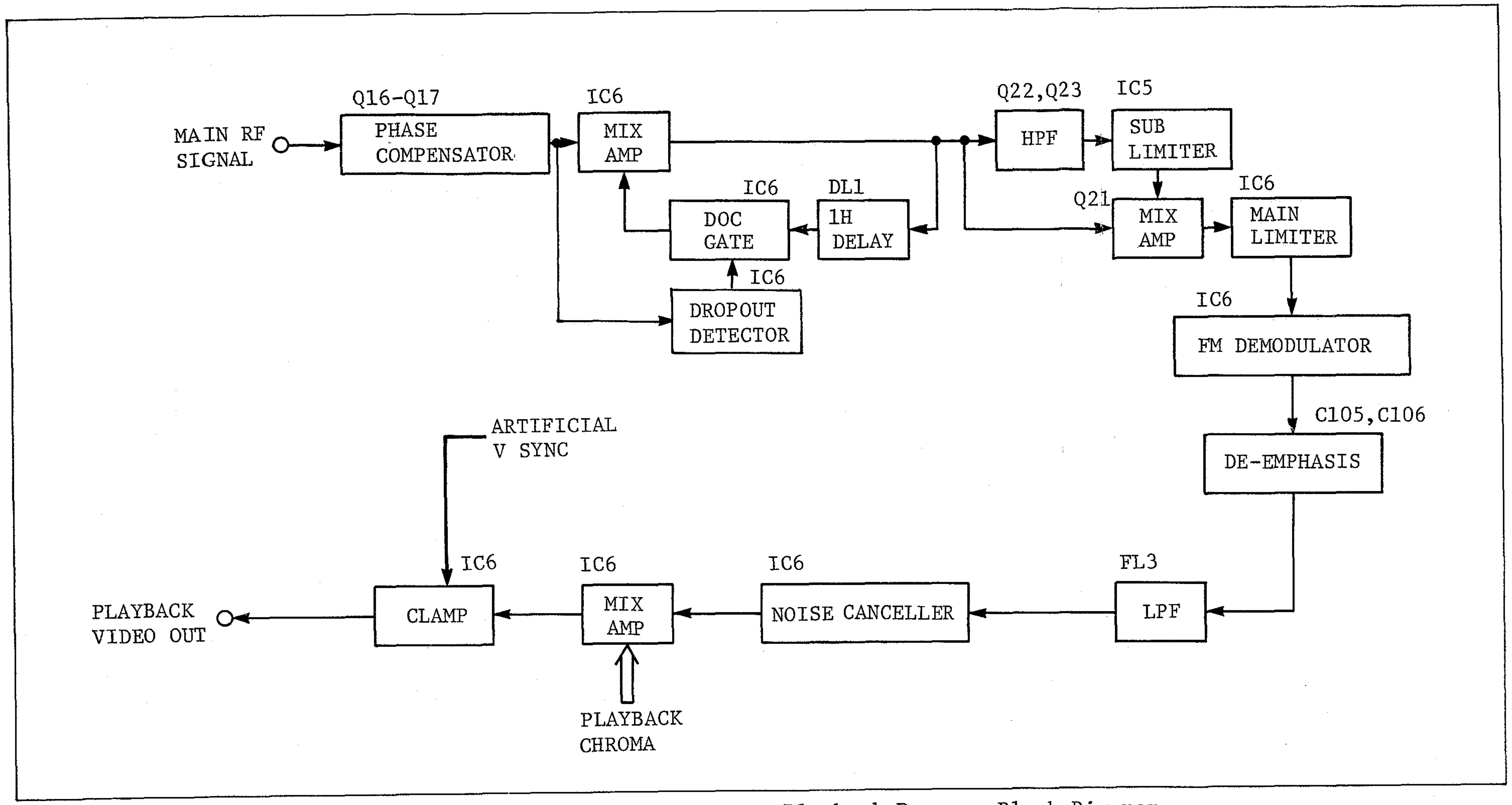

MAIN RF SIGNAL
Q16-Q17
PHASE COMPENSATOR
IC6
MIX AMP
IC6
DOC GATE
DL1
1H DELAY
IC6
DROPOUT DETECTOR
Q22,Q23
HPF
IC5
SUB LIMITER
Q21
MIX AMP
IC6
MAIN LIMITER
IC6
FM DEMODULATOR
C105,C106
DE-EMPHASIS
FL3
LPF
IC6
NOISE CANCELLER
IC6
MIX AMP
PLAYBACK CHROMA
ARTIFICIAL V SYNC
IC6
CLAMP
PLAYBACK VIDEO OUT

Figure 4-16. Luminance Playback Process Block Diagram.

PHASE COMPENSATOR

This circuit is necessary to compensate for the phase error called "group delay" caused by filters which affects the picture quality during playback, especially at the edge of the picture.

DROPOUT COMPENSATOR

All VTR's incorporate some form of dropout compensation. Dropout is actually a momentary loss of playback RF signal, whether it is due to dirt on the tape or heads, missing oxide, etc.
Uncompensated dropout produces white or black streaks in the picture, which represent the missing information.
The form of compensation most often taken, and employed here, is to substitute for that missing piece of information the last good piece of information that was played.

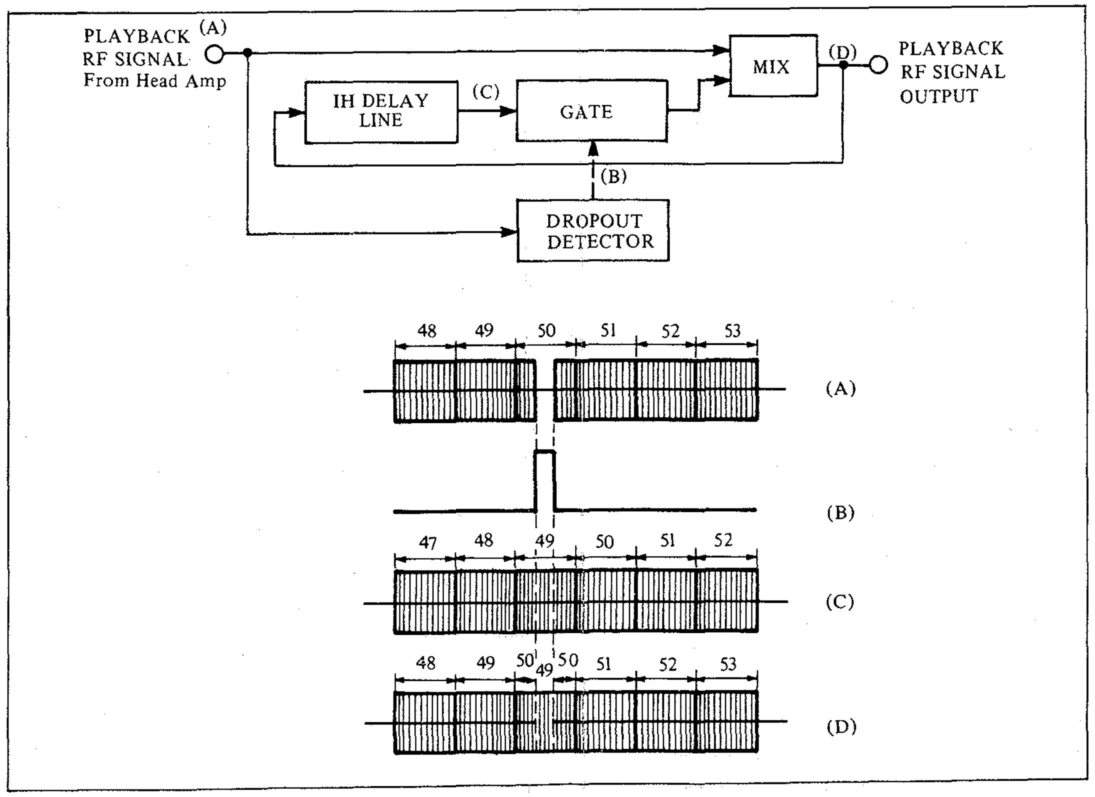

PLAYBACK RF SIGNAL From Head Amp
(A)
IH DELAY LINE
(C)
GATE
(B)
DROPOUT DETECTOR
MIX
(D)
PLAYBACK RF SIGNAL OUTPUT
48
49
50
51
52
53
(A)
(B)
47
48
49
50
51
52
(C)
48
49
50
49
50
51
52
53
(D)

Figure 4-17. Dropout Compensator.

For instance, assume that during playback, everything is fine until horizontal line 50 is reached. Further assume that due to a dropout, part of line 50 is missing. What the compensator does is to repeat line 49 instead of passing on the noisy line 50. Line 49 can be repeated a maximum of 3 times.
The compensator is composed of a detector, a delay line, and a switch, in a configuration as shown in Figure 4-17. The final output of the compensator is constantly being fed to the delay line. Normally, the output of the delay line is not used because when there are no dropouts, the RF signal is good, and is passed directly through the mixer to the output.
But in the event of a dropout, the output of the delay line, which is the previous line of good information, is switched through the gate to the mixer in place of the direct RF signal. In this condition, the output of the delay line is actually feeding its own input. This is allowed to occur for 3 consecutive horizontal lines before the switch moves back to the direct RF path.
The use of the dropout compensator produces a much cleaner-looking picture.

DOUBLE LIMITER

Since the signal is pre-emphasized during the record mode, overshoots can be produced which may not be completely removed by the white and black clippers in the recording process. This emphasized video signal drives the FM modulator and is then sent to the recording amplifier as explained in the Recording Process.
In this condition, the FM signal is subject to amplitude distortions producing noisy pictures.
The Double Limiter circuit is used to remove AM components caused by overmodulation to improve the S/N ratio.

FM DEMODULATOR

After the signal has been dropout-compensated and amplitude limited, it is ready to be demodulated into a video signal. The demodulation process is performed by the FM demodulator, and a few external components.

Limiter balance adjustment is provided so that the demodulation process can be kept as clean as possible.

DE-EMPHASIS

Because the video signal was emphasized in the recording process, it must now be de-emphasized in playback. A simple R-C network performs this action.

LOW PASS FILTER

The final output of the demodulator is not an actual video waveform, but rather a pulse train whose pulse interval is proportional to the desired video signal. Low pass filtering of this pulse train signal reconstructs the video waveform. Low pass filter FL3 is used for this purpose.

NOISE CANCELLATION

The video signal is now ready for cancellation of the noise components. This is performed inside of IC6 by splitting the luminance signal into 2 paths. The first path is unprocessed. The second path is high pass filtered, limited and then is subtracted from the first path. This process gives an overall improvement of the luminance signal-to-noise ratio.

Y-C MIXING

The final stage of the playback process is the combination of the playback luminance and chrominance signals.
The chrominance signal supplied from the Chrominance Processing circuits is sent to pin 29 of IC6 and added to the Playback luminance signal.

Detailed Description

PHASE COMPENSATOR

This is used to correct any phase errors introduced by filters or frequency response shapers, and is shown in Figure 4-18.
Since the response of the playback RF signal was shaped, phase compensation is necessary before further processing.
Phase compensator Q17, L24, C83, Q18, R102, Q20, C84, L25, R105 and other components perform the desired action before being passed to IC6 via the chroma trap or R-C coupling network shown in Figure 4-19.

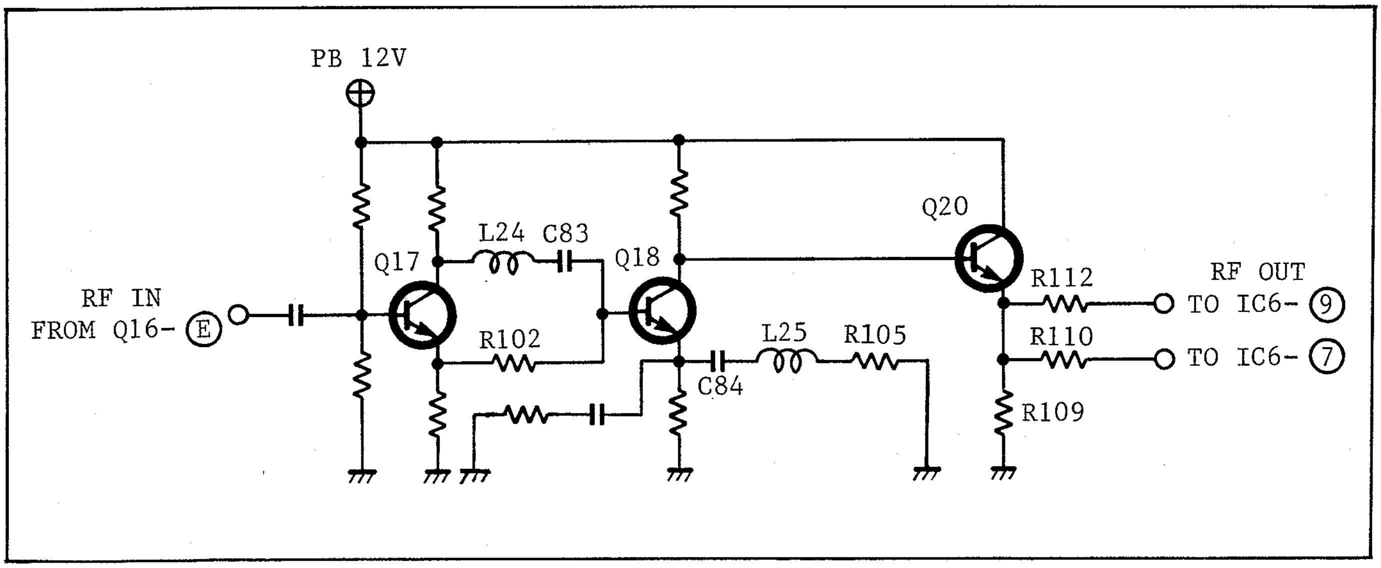


Figure 4-18. Phase Compensator.

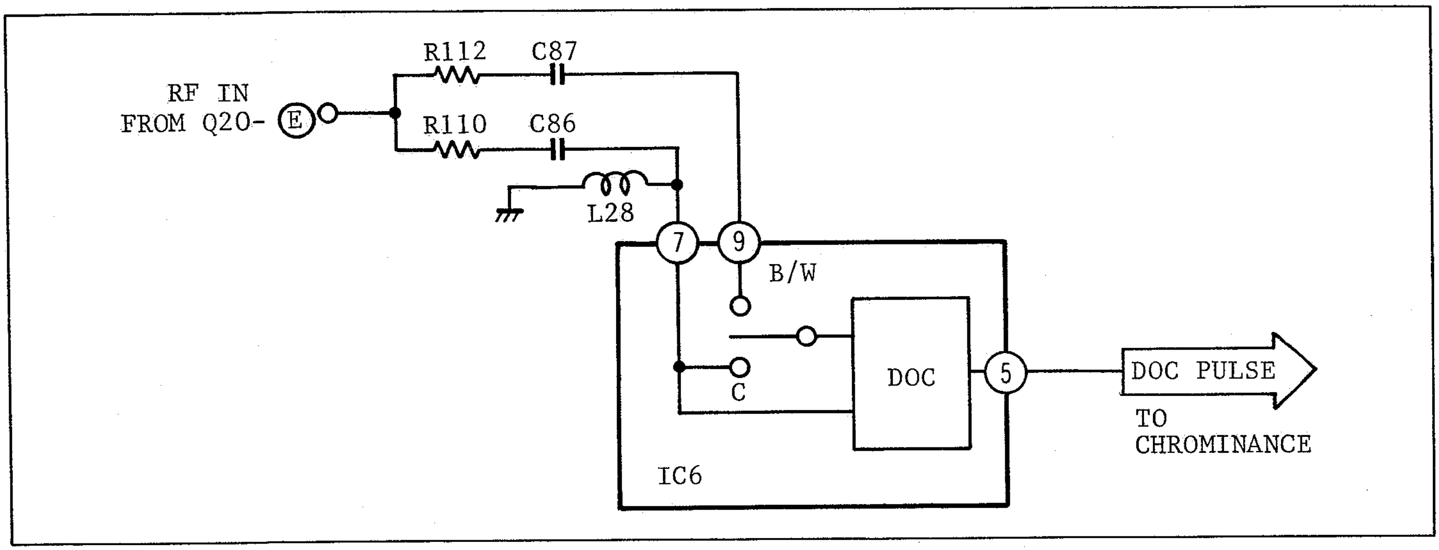

R112
C87
RF IN
FROM Q20- Ⓔ
R110
C86
L28
7
9
B/W
DOC
C
5
DOC PULSE
TO
CHROMINANCE
IC6

Figure 4-19. B/W Color Switching.

B/W COLOR SWITCHING

In the color mode, the B/W color switch shown in Figure 4-19 is set to the C position, and the chroma trapped RF signal is passed to the Dropout Compensator circuit (DOC).
In the B/W mode, there is no need to trap the converted color subcarrier, and the RF signal is passed directly to the DOC via pin 9.

DROPOUT COMPENSATOR .

If the dropout occurs in the playback signal, a positive going pulse appears at point (B). See Figure 4-20.
This pulse changes the DOC switch so that it selects the delayed signal entering at the point (C) instead of the undelayed input from pin 7 or 9.
Note that the DOC switch is an electronic switch inside of IC6 but is shown as a mechanical switch for simplicity.

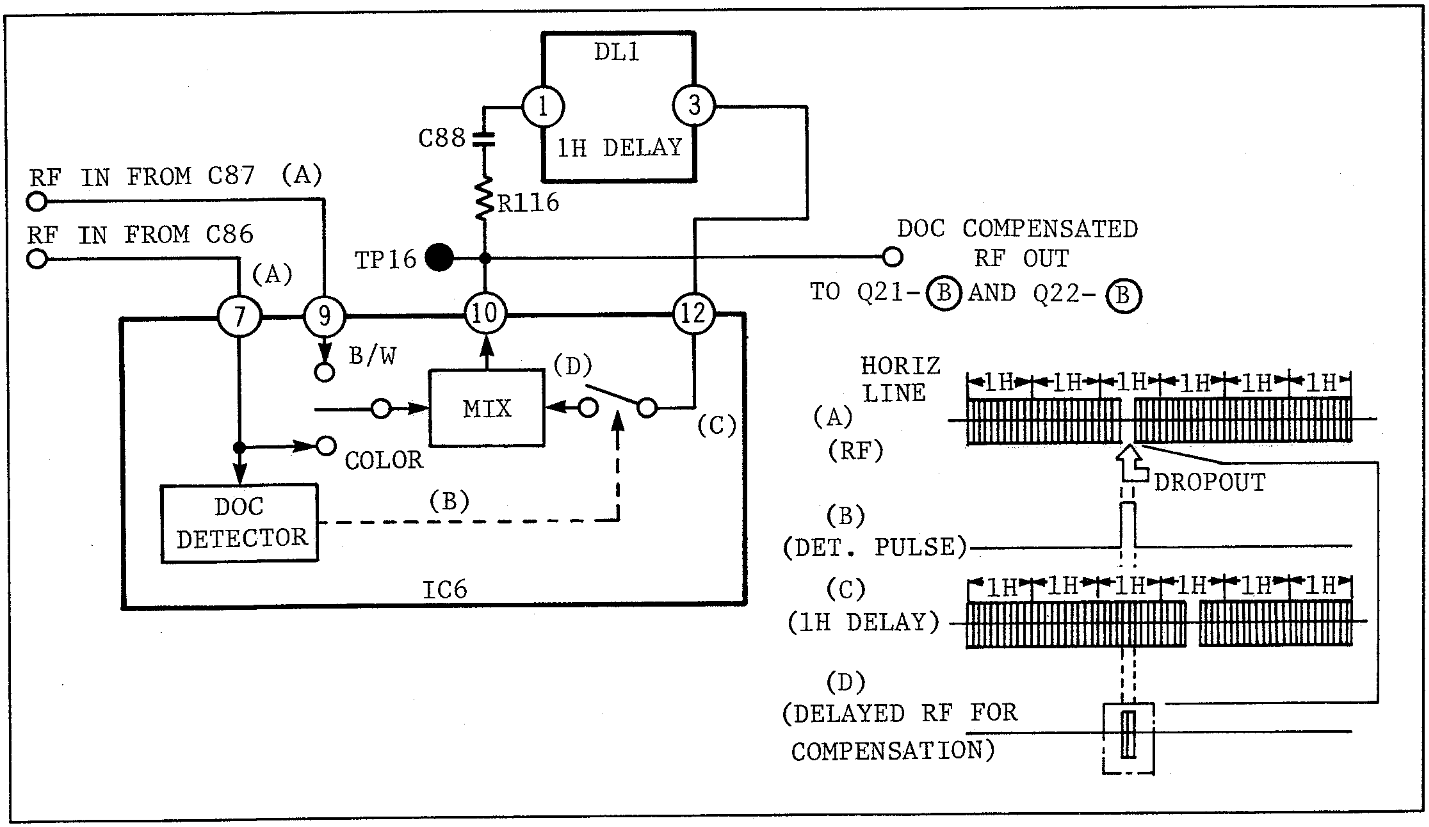

DL1
1
3
1H DELAY
C88
R116
RF IN FROM C87 (A)
RF IN FROM C86
(A)
TP16
DOC COMPENSATED
RF OUT
TO Q21-Ⓑ AND Q22-Ⓑ
7
9
10
12
B/W
(D)
MIX
(C)
COLOR
DOC
DETECTOR
(B)
IC6
HORIZ
LINE
(A)
(RF)
1H 1H 1H 1H 1H 1H
DROPOUT
(B)
(DET. PULSE)
(C)
(1H DELAY)
1H 1H 1H 1H 1H 1H
(D)
(DELAYED RF FOR
COMPENSATION)

Figure 4-20. Dropout Compensator.

The pulse which occurs during a dropout is used as a dropout inhibit signal in the chrominance section. The low level of the dropout pulse is sent to pin 9 of IC2 in the chrominance section where it is used to stop the AFC-Rotary Phase circuits. In this way, the color signal does not change during the dropout.

DOUBLE LIMITER

The FM signal on the tape which will be read during playback may contain large AM components in the high frequency portions. When this signal is limited by a conventional (single) limiter, a loss of carrier can result as shown in Figure 4-21. This lack of carrier causes black spikes known as overmodulation noise. To prevent this noise, a double limiter method is used. A partial schematic of the Double Limiter is given in Figure 4-22. The playback FM signal is split into two paths, one goes to the high pass filter and sub-limiter, then is sent to the mix amp. The other goes to the mix amp directly.

The path which goes to the high pass filter (consisting of Q22, C94, R136, Q23 and other components) removes the low frequency (AM) components, and the remaining carrier signal is supplied to the sub-limiter, pin 14 of IC5. The limited signal out of pin 6 is sent to mix amplifier Q21. The other path goes directly to mix amplifier Q21. These two signals are then mixed and sent to the regular limiter circuit. The sub-limiting action is adjustable with LIMITER BALANCE 2 (R147) so that balanced limiting can be achieved (unbalanced limiting causes an unwanted frequency to be present in the demodulated signal). Final limiting action is adjustable with R122.

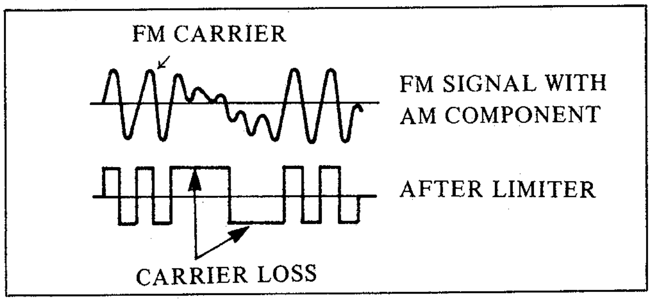

FM CARRIER
FM SIGNAL WITH AM COMPONENT
AFTER LIMITER
CARRIER LOSS

Figure 4-21. FM Signal Carrier Loss.

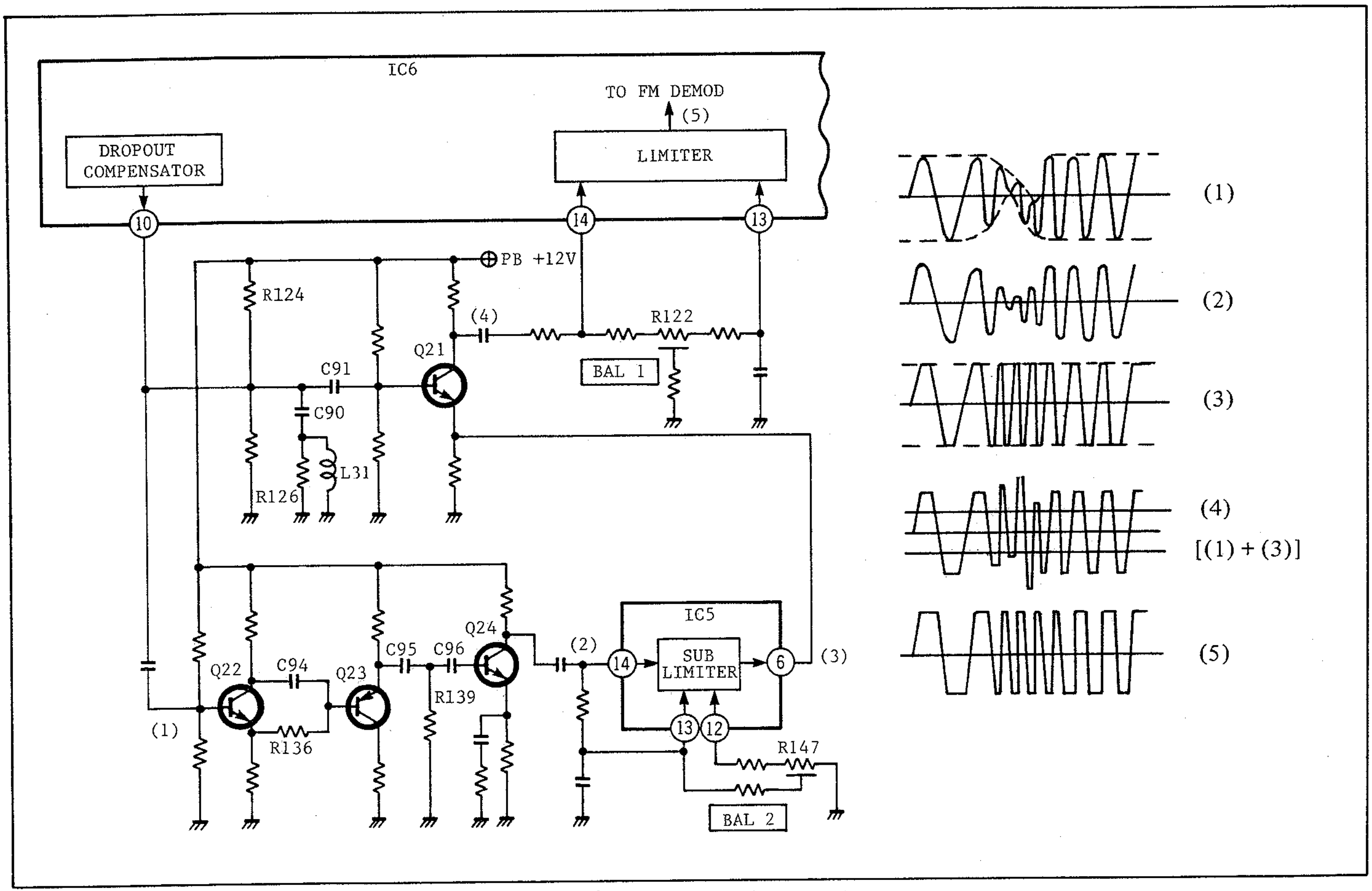

IC6
TO FM DEMOD
(5)
DROPOUT COMPENSATOR
LIMITER
10
14
13
PB +12V
R124
(4)
R122
Q21
BAL 1
C91
C90
L31
R126
Q22
C94
Q23
R136
(1)
C95
C96
Q24
R139
(2)
IC5
SUB LIMITER
14
6
(3)
13
12
R147
BAL 2
(1)
(2)
(3)
(4)
[(1) + (3)]
(5)

Figure 4-22. Double Limiter.

FM DEMODULATOR

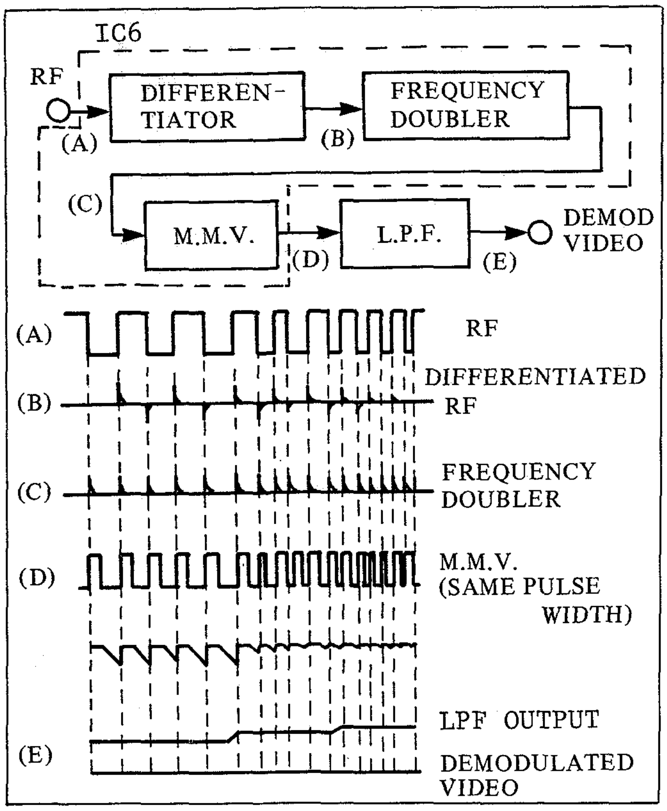

IC6
RF
DIFFEREN-TIATOR
FREQUENCY DOUBLER
(A)
(B)
(C)
M.M.V.
L.P.F.
(D)
(E)
DEMOD VIDEO
(A)
RF
(B)
DIFFERENTIATED RF
(C)
FREQUENCY DOUBLER
(D)
M.M.V. (SAME PULSE WIDTH)
LPF OUTPUT
(E)
DEMODULATED VIDEO

Figure 4-23. FM Demodulator.

The operation of the FM Demodulator is illustrated in Figure 4-23. First the limited RF signal is sent to the differentiator and the frequency doubler where pulses are produced corresponding to each edge of the RF signal. The pulses are then used to trigger a monostable multivibrator whose output consists of equal width pulses of varied spacing.

The output of the monostable multivibrator is finally converted by the LPF into a DC level which corresponds to the varying level of the luminance signal. The FM Demodulator is contained in IC 6 (see Figure 4-24), except for the LPF (FL3) which follows the de-emphasis circuit described in the next paragraph.

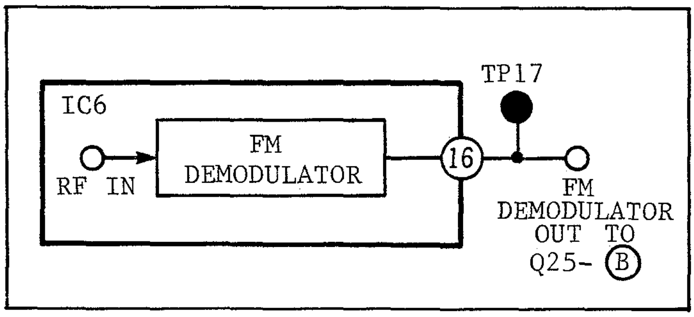

IC6
RF IN
FM DEMODULATOR
16
TP17
FM DEMODULATOR OUT TO Q25- Ⓑ

Figure 4-24. FM Demodulator.

LOW PASS FILTER AND DE-EMPHASIS

Since the demodulated luminance signal still has emphasis imposed upon it which it received in the recording mode, de-emphasis must be performed to obtain the normal signal.
De-emphasis is provided by C105 and C106 (Figure 4-25) connected in the emitter of Q25, so that this amplifier (Q25) has the required frequency characteristic. The de-emphasized video signal is then applied to the Low Pass Filter (FL3) which removes the carrier frequency component as shown in Figure 4-27. The filtered signal is then passed through the VIDEO PLAYBACK LEVEL control (R163).

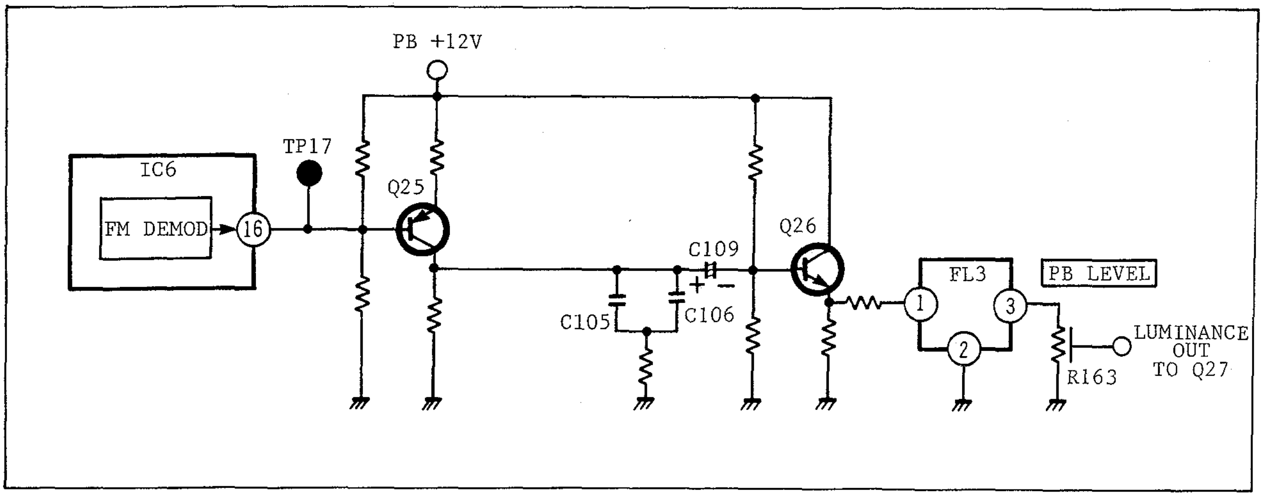

PB +12V
IC6
FM DEMOD
16
TP17
Q25
C109
+ −
C105
C106
Q26
FL3
1
2
3
PB LEVEL
R163
LUMINANCE OUT TO Q27

Figure 4-25. Low Pass Filter and De-Emphasis.

SMEAR ELIMINATION AND PICTURE CONTROL

L33 and C112 (Figure 4-26) forms emitter bypass network which passes the high frequencies in the video signal to eliminate smearing in the picture and to enhance the waveform of the sync pulse edges.
Picture control (R158) adjusts the frequency characteristic of the de-emphasis stage.

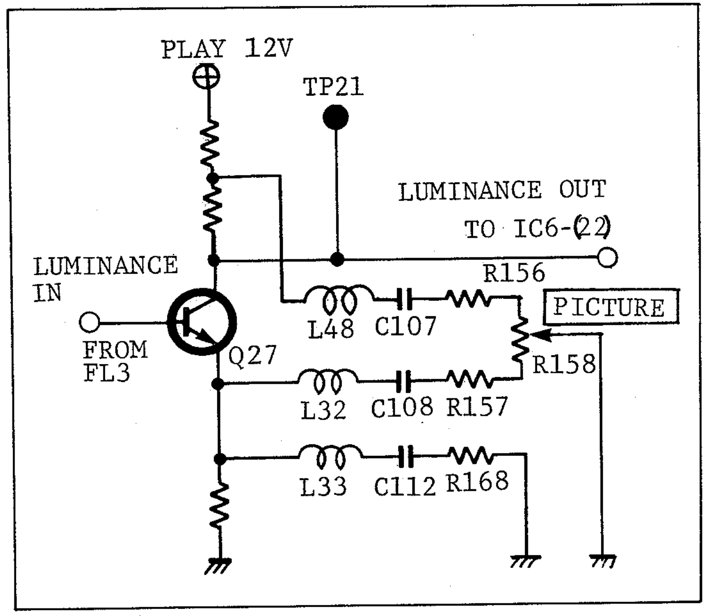

PLAY 12V
TP21
LUMINANCE OUT
TO IC6-㉒
LUMINANCE
IN
FROM
FL3
Q27
L48
C107
R156
PICTURE
R158
L32
C108
R157
L33
C112
R168

Figure 4-26. Smear Elimination.

NOISE CANCELLER

To further improve the overall S/N ratio in playback a noise canceller is used. See Figures 4-27 and 4-28. Before the Noise Canceller operation, another LPF (FL4) is included in color mode to remove any remaining energy above 3MHz. The playback signal enters pin 22 of IC6. It is amplified and split into two paths. One path goes to the B/W side of the B/W Switch.

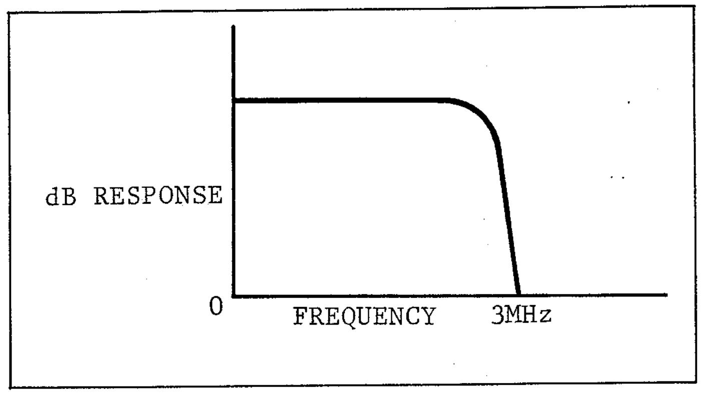


Figure 4-27. Characteristic of FL3.

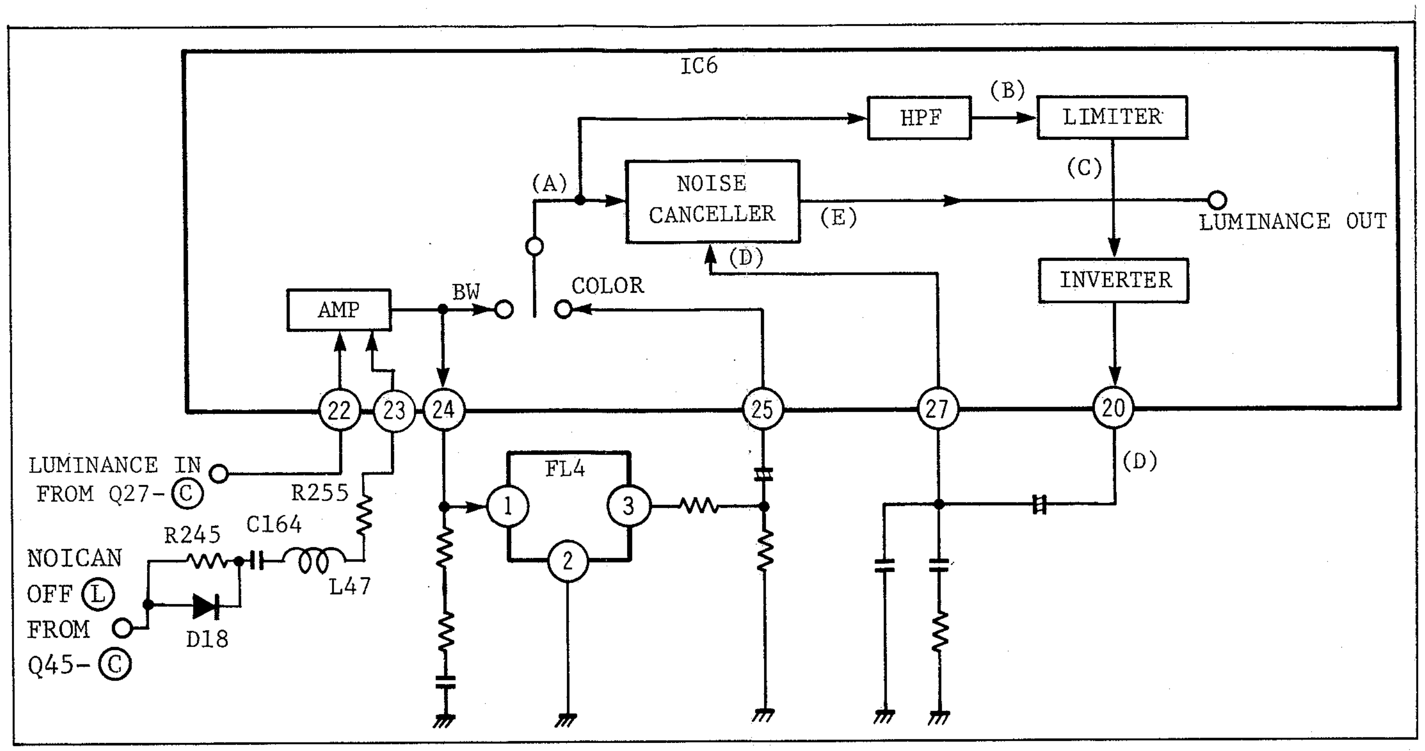

IC6
HPF
(B)
LIMITER
(C)
(A)
NOISE CANCELLER
(E)
LUMINANCE OUT
(D)
INVERTER
AMP
BW
COLOR
22
23
24
25
27
20
(D)
LUMINANCE IN
FROM Q27-Ⓒ
R255
R245
C164
L47
NOICAN
OFF Ⓛ
FROM
Q45-Ⓒ
D18
FL4
1
2
3

Figure 4-28. Noise Canceller Circuit.

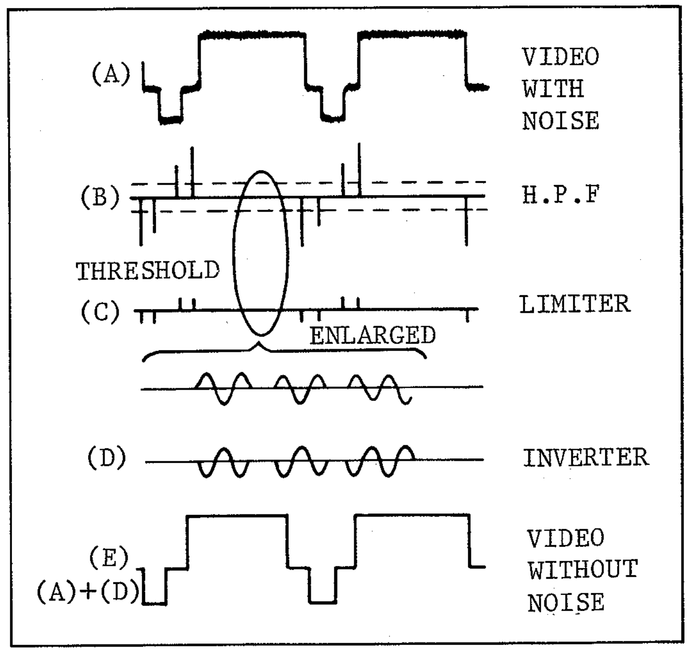

(A)
VIDEO WITH NOISE
(B)
H.P.F
THRESHOLD
(C)
ENLARGED
LIMITER
(D)
INVERTER
(E)
(A)+(D)
VIDEO WITHOUT NOISE

Figure 4-29. Noise Canceller.

The other path leaves IC6 through pin 24 and goes to the low pass filter (FL4). The output of the low pass filter re-enters IC6 through pin 25. Either the filtered signal (Color mode) or the unfiltered signal (B/W mode) will appear at the common leg of the B/W Color Switch inside of IC6. At this point, noise cancellation is applied by splitting the signal into two paths. One path goes to the noise canceller (Mix amp) directly, the other path is high pass filtered (only high frequency noise is passed) and limited, inverted and routed through pin 20 back to pin 27 to add inverted noise to the originally noisy signal. This action removes high frequency random noise as shown in (E) of Figure 4-29.

Y-C MIXING AND ARTIFICIAL V SYNC

The noise reduced luminance signal is then sent to the Y-C mixing circuit to produce the complete color signal. The chroma signal supplied from the Chrominance Circuit enters at pin 29 of IC6 (Figure 4-30) and is mixed with the luminance signal to produce the complete video signal.
When the remote control Model AG-A600 is connected. An artificial Vertical Sync pulse is inserted into the video signal for the REVERSE/FORWARD and SLOW/STILL modes. This pulse is needed because the received Vertical Sync is degraded by noise during the blanking interval in these modes. During the artificial V.Sync pulse, the output of the MIX stage is clamped by the pulse, and any noise is muted.

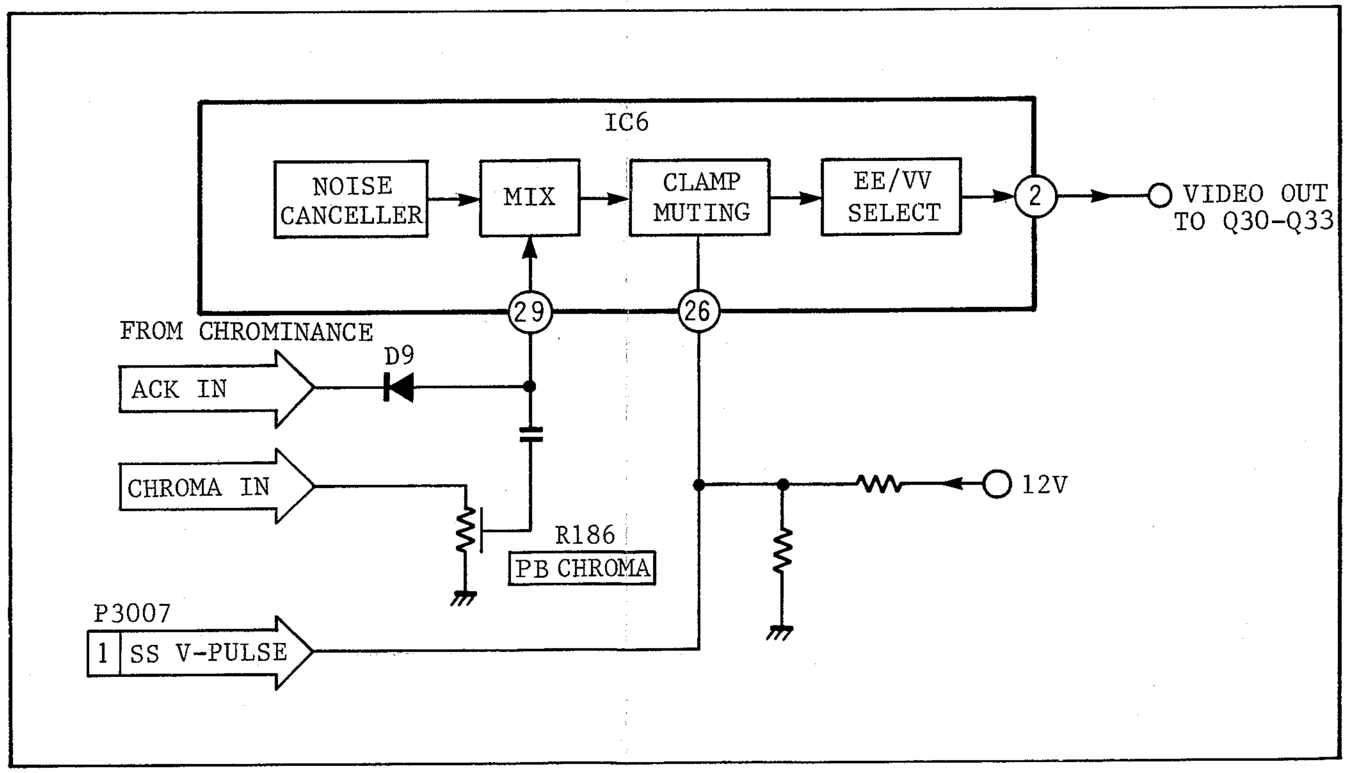

IC6
NOISE CANCELLER
MIX
CLAMP MUTING
EE/VV SELECT
2
VIDEO OUT
TO Q30-Q33
29
26
FROM CHROMINANCE
ACK IN
D9
CHROMA IN
R186
PB CHROMA
12V
P3007
1
SS V-PULSE

Figure 4-30. Y-C Mixing and Artificial V Sync.

CHROMINANCE RECORDING PROCESS

General Description

The simplified block diagram for the Chrominance Record Process is shown Figure 5-1.

3.58 MHz BAND PASS FILTER

The incoming video signal is sent through a band pass filter so that only the information centered around 3.58MHz (color information) remains.

ACC (Automatic Color Gain Control)

The ACC inside IC1 uses the peak level of the burst for chroma control. If the incoming chroma level drops, the ACC circuit increases its gain to compensate for this and maintain an approximately constant level. The converse is also true.

BALANCED MODULATOR 1

This balanced modulator inside of IC1 performs the necessary downconversion and rotation of the chroma signal so that it can be recorded onto the tape. One input to the balanced modulator is the chrominance signal from the ACC. The second input to the balanced modulator is a 4.2MHz rotational signal derived from another part of the chrominance board where it is phase-locked to horizontal sync. The output of the balanced modulator is the difference between the two input signals, or 629kHz which is also phase-locked to the horizontal sync.

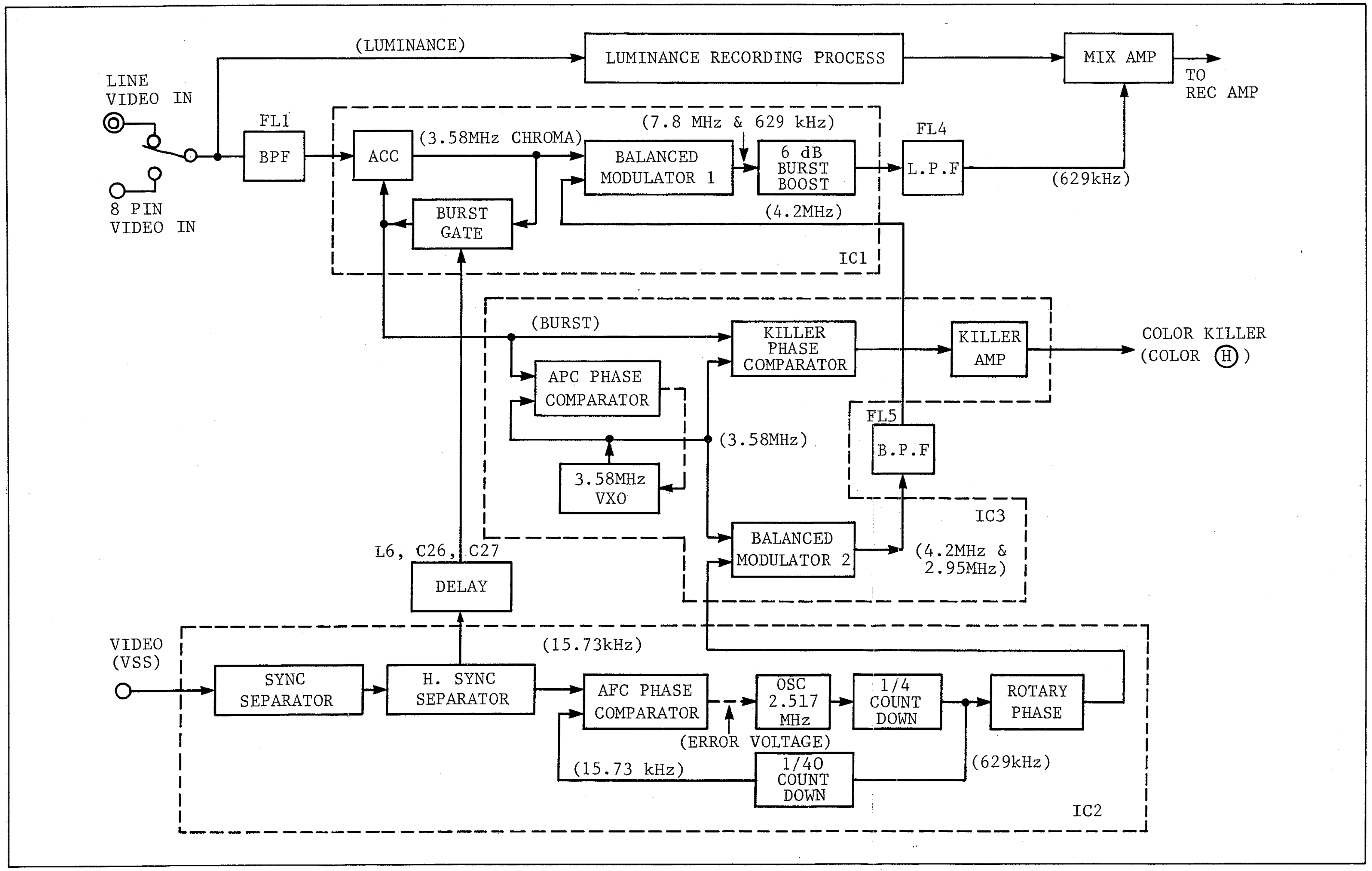

(LUMINANCE)
LUMINANCE RECORDING PROCESS
MIX AMP
TO REC AMP
LINE VIDEO IN
8 PIN VIDEO IN
FL1
BPF
ACC
(3.58MHz CHROMA)
(7.8 MHz & 629 kHz)
BALANCED MODULATOR 1
6 dB BURST BOOST
FL4
L.P.F
(629kHz)
BURST GATE
(4.2MHz)
IC1
(BURST)
KILLER PHASE COMPARATOR
KILLER AMP
COLOR KILLER
(COLOR Ⓗ)
APC PHASE COMPARATOR
(3.58MHz)
FL5
B.P.F
3.58MHz VXO
IC3
BALANCED MODULATOR 2
(4.2MHz & 2.95MHz)
L6, C26, C27
DELAY
VIDEO (VSS)
(15.73kHz)
SYNC SEPARATOR
H. SYNC SEPARATOR
AFC PHASE COMPARATOR
OSC 2.517 MHz
1/4 COUNT DOWN
ROTARY PHASE
(ERROR VOLTAGE)
(15.73 kHz)
1/40 COUNT DOWN
(629kHz)
IC2

Figure 5-1. Chrominance Recording Process Block Diagram.

BURST BOOST (6dB up)

One method of improving the overall color S/N ratio is to increase the level of the burst signal by 6dB. The boost circuit is controlled by a burst gate pulse which ensures that only the burst signal, and not the rest of the color signal, is boosted.

COLOR KILLER

This section of IC1 either passes or blocks the signal coming out of balanced modulator 1. In the color mode, the signal is passed to the Luminance section to be amplified and recorded. In the B/W mode, any output from balanced modulator 1 is blocked, so that it does not contribute any noise to the recording.

AFC-ROTARY PHASE GENERATOR

In order to produce a 629kHz signal whose phase changes by 90° every time the video signal progresses by one horizontal line, it is necessary to phase-lock the 629kHz generator to the horizontal sync signal. This explains why the AFC circuit and the rotary generator, IC2, work together.
The process starts with a 2.517MHz voltage-controlled oscillator inside of IC2. This continuous wave signal is sent to a divide-by-four counter with four continuous outputs. These outputs are at 629kHz and have phases of 0°, 90°, 180°, 270°. Each of these outputs is used as one input to its own respective AND gate inside of IC2.
Only one AND gate will be allowed to pass a signal at a time. If the gates are fired in the proper order, and change just at the time that horizontal sync occurs, the phase rotation process will be accomplished. The second input to the AND gates is the firing signal which will allow the gate to pass its 629kHz signal. Each gate receives a separate firing signal. See diagram Figure 5-2.

All four of the 629kHz signals are continuously present at the gate inputs. It is the firing signal which turns on the successive gates, therefore the four firing signals must be locked to horizontal sync in order to perform the desired gating.
What is desired is that for the first horizontal line of Field 1 of the video information, Gate 1 should be ON, and 2, 3, 4 should be OFF. For the second line of Field 1, Gate 2 is ON, and 3, 4, 1 are OFF. For Line 3, Field 1, Gate 3 is ON, and 4, 1, 2 are OFF. For Line 4, Field 1, Gate 4 is ON, and 1, 2, 3 are OFF.
Since the direction of phase rotation is reversed between video fields, the firing order must be changed for Field 2. For Line 1 of Field 2, Gate 1 is ON, 2, 3, 4 are OFF. For Line 2, Field 2, Gate 4 is ON, and 1, 2, 3 are OFF. For Line 3, Field 2, Gate 3 is ON, 4, 1, 2, are OFF. For Line 4, Field 2, Gate 2 is ON, and 3, 4, 1 are OFF.
The 629kHz signal is counted down by 40 to obtain a horizontal rate signal (15.73kHz), and is sent as one input to the switching pulse generator shown as a Ring Counter in Figure 5-2. The switching pulse generator will produce firing signals to activate the gates in the proper order. Another input to the switching pulse generator is the head switching signal. This facilitates the reverse firing order for Field 2, or the "B" video head.
The 629kHz signal which is counted down by 40 is also sent as one input to the AFC comparator circuit inside of IC2 (See Figure 5-1). The other input to the AFC comparator is the incoming horizontal sync signal. This forms the phase-lock loop. If the 629kHz signal being generated is not perfectly phase-locked to the incoming horizontal sync signal, the AFC comparator will detect this and deliver a DC error voltage back to the 2.517MHz VCO to drive it in such a way that phase-locking does occur.
The output of each gate is OR gated out of IC2 into balanced modulator 2.

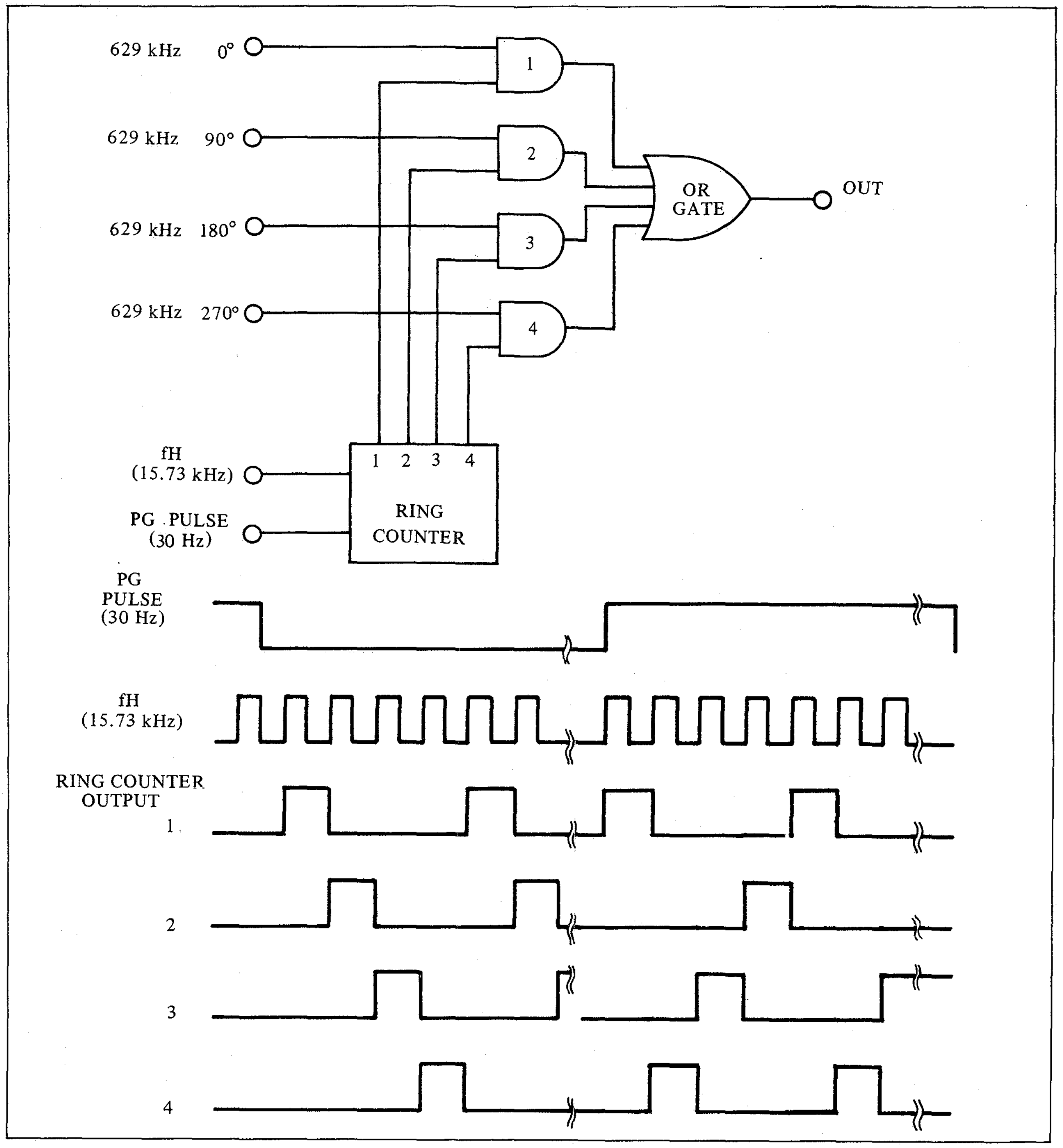


Figure 5-2. Rotary Phase Generator.

BALANCED MODULATOR 2

The 629kHz Rotary Phase signal becomes one input to balanced modulator 2 inside of IC3.
The other input is a 3.58MHz sine wave signal, of the same phase as the incoming color burst signal. The output, selected as the sum will be a 4.2MHz signal which is phase-locked to the incoming burst and sync signal, and is rotary phased.

APC

The 3.58MHz sine wave signal into balanced modulator 2 is obtained from a VXO (voltage controlled crystal oscillator) in the APC loop of IC3.
The APC circuit is another phase-lock loop arrangement. One input to the APC comparator is the incoming burst signal, as it is gated through the burst gate in IC1. The APC circuit drives VXO, X2 so that is produces the desired 3.58MHz sine wave of the proper phase. The output of the crystal is sent to the second input of the APC comparator. Thus, any deviation in the crystal's output will be compared with the incoming burst signal in the APC comparator. The comparator will produce an error voltage to drive X2 in a compensatory fashion. The 4.2MHz phase-locked rotational signal out of balanced modulator 2 is used in balanced modulator 1 to develop the final 629kHz phase-locked, rotational color signal.

Detailed Description

3.58MHz BAND PASS FILTER

The input video signal is split into two parts--one path for luminance processing, the other for chrominance processing. The incoming video signal is sent to 3.58MHz band pass filter FL1 which passes only the color information centered around 3.58MHz (Figure 5-3), which is fed to the ACC circuit, Pin (1) of IC1 (Figure 5-4). The chrominance signal can be monitored at Pin (1) of IC1.

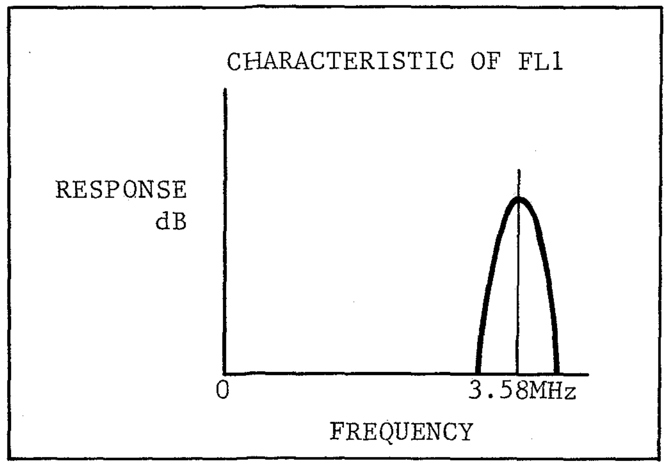


Figure 5-3. Band Pass Filter FL1.

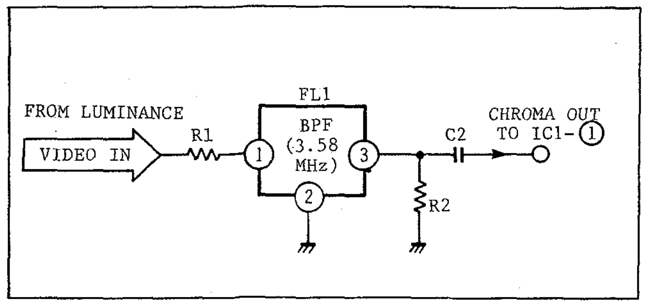

FROM LUMINANCE
VIDEO IN
R1
FL1
BPF
(3.58 MHz)
1
2
3
C2
R2
CHROMA OUT
TO IC1-①

Figure 5-4. Band Pass Filter FL1.

ACC

The band pass filtered chroma signal enters Pin 1 of IC1 (Figure 5-5). It is sent through ACC amplifier, whose gain is variable out of the ACC amplifier, it is split into two paths. One path goes to the burst gate circuit and the other path to Balanced Modulator 1. The burst gate pulse applied to Pin 4 of IC1. Allows only the burst portion of the chroma signal to pass to the Detector. (derivation of this burst gate pulse will be described later).

The detector receives the burst signal which is converted into a DC signal by C3 and R3 and fed back to the ACC stage. In the recording mode, the chroma level or burst level is very stable, so the ACC loop gain or response should not be set high. Too high gain setting may not allow a constant chroma level to be recorded on the tape.

BALANCED MODULATOR 1

The ACC color signal is now applied as one input to balanced modulator 1, which is contained totally inside of IC1 (See Figure 5-6). There are two inputs and one output. The purpose of this balanced modulator is to produce a 629kHz chroma signal with phase rotation. To produce a phase rotated output, the second input to this balanced modulator must also be a phase rotated signal, and must be of such a frequency that the difference between the two input frequencies is the desired output frequency. Therefore, the second input (applied to Pin 14), is a 4.2MHz rotational continuous sine wave signal which is phase-locked to the input horizontal sync. As described in the AFC Rotary Phase Generator Paragraph, the 4.2MHz signal will change its phase by 90° every time a new horizontal sync signal is received.

The ouput contains two bands of information; the sum and difference of the two input signals. The sum is a 7.8MHz rotational chroma signal, and the difference is a 629kHz rotational chroma signal.

The difference signal is selected by the low pass filter (FL4) which follows the 6dB Burst Boost Stage.

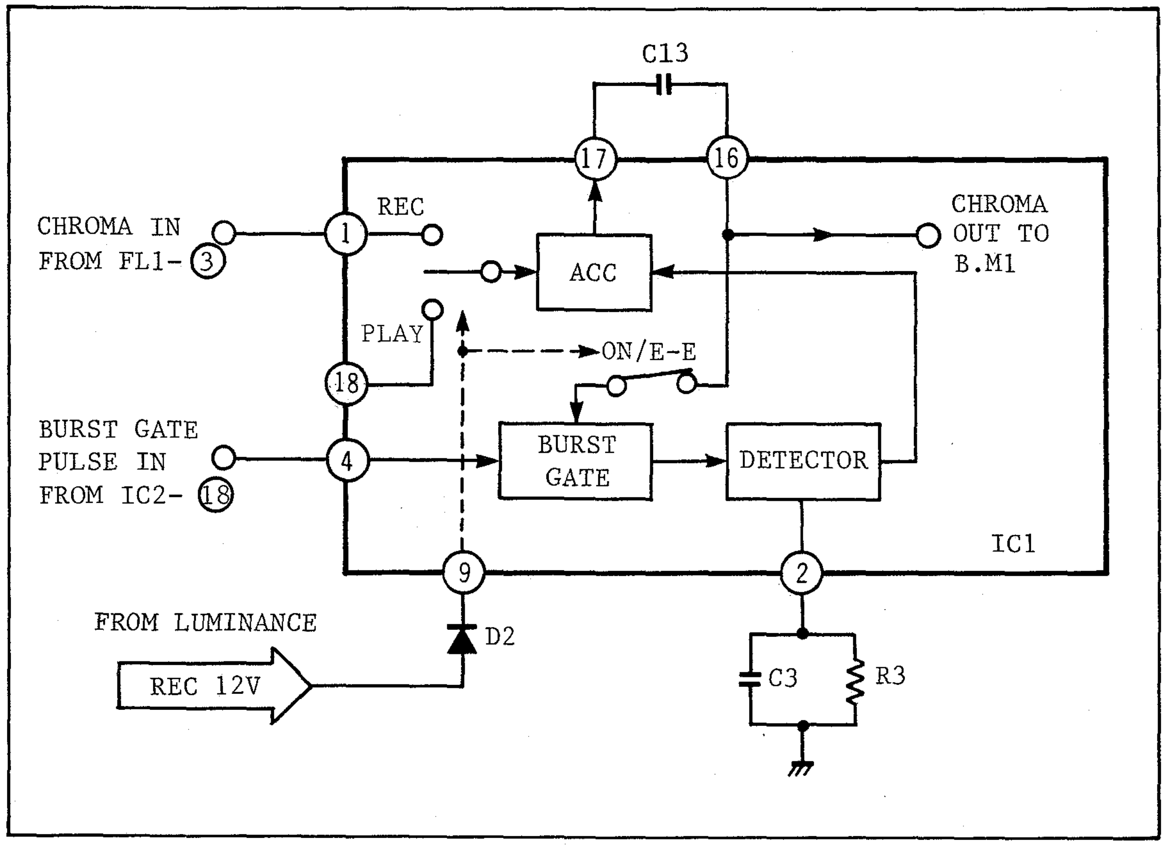

C13
17
16
CHROMA IN
FROM FL1-③
1
REC
ACC
CHROMA
OUT TO
B.M1
PLAY
18
ON/E-E
BURST GATE
PULSE IN
FROM IC2-⑱
4
BURST
GATE
DETECTOR
IC1
9
2
FROM LUMINANCE
REC 12V
D2
C3
R3

Figure 5-5. ACC Circuit.

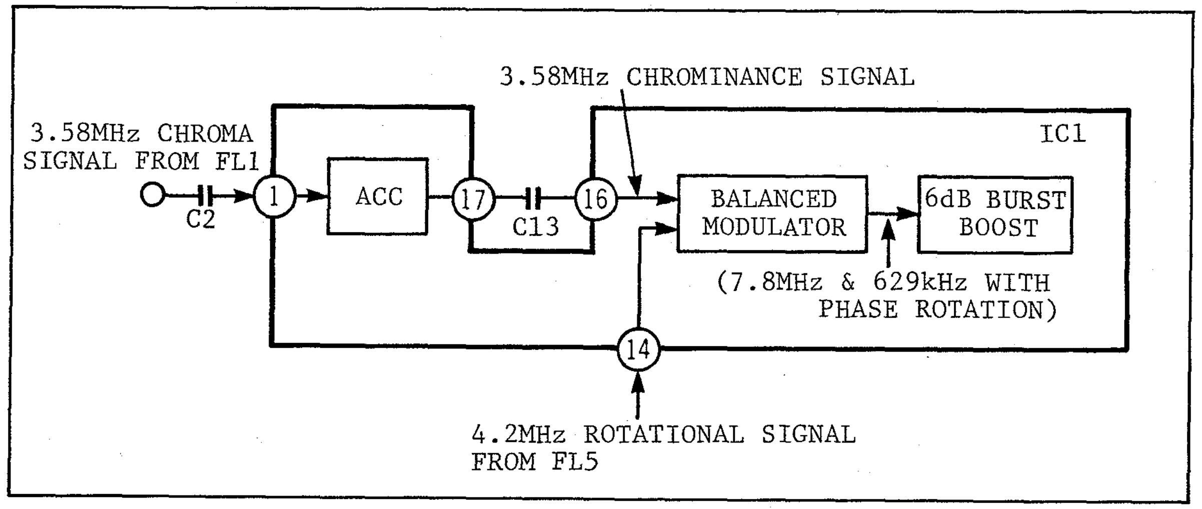

3.58MHz CHROMINANCE SIGNAL
3.58MHz CHROMA
SIGNAL FROM FL1
C2
1
ACC
17
C13
16
BALANCED
MODULATOR
6dB BURST
BOOST
IC1
(7.8MHz & 629kHz WITH
PHASE ROTATION)
14
4.2MHz ROTATIONAL SIGNAL
FROM FL5

Figure 5-6. Balanced Modulator 1.

BURST BOOST

The balanced modulated chroma signal is then sent to the 6dB Burst Boost circuit inside of IC1 (Figure 5-7). When the Burst Gate Pulse if received at pin 4 of IC1, the level of the color burst is increased by 6dB to assure an adequate level for the recorded burst.

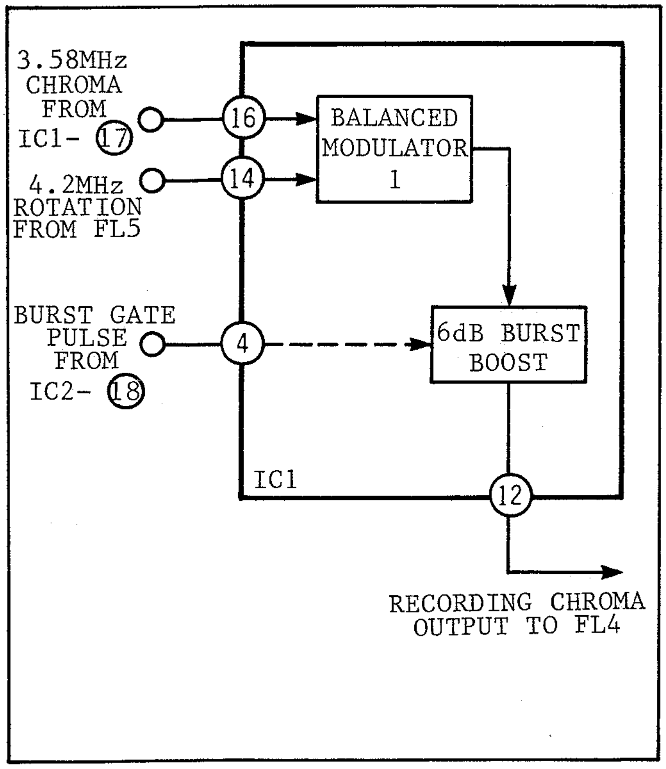

3.58MHz CHROMA FROM IC1- ⑰
4.2MHz ROTATION FROM FL5
BURST GATE PULSE FROM IC2- ⑱
16
14
4
BALANCED MODULATOR 1
6dB BURST BOOST
IC1
12
RECORDING CHROMA OUTPUT TO FL4

Figure 5-7. Balanced Modulator 1 and Burst Boost.

629kHz LOW PASS FILTER

The 6dB boosted chroma signal leaves Pin 12 of IC1 and is sent to Pin 1 of FL4 the 629kHz low pass filter. At this moment, the incoming chroma signal will contain the sum and difference. The sum is a 7.8MHz rotational chroma signal. The difference is a 629kHz rotational chroma signal. The sum signal is eliminated by the low pass filter and the output is a 629kHz rotational chroma signal.

The low pass filtered 629kHz rotational chroma signal is fed back to a 3dB amplifier in IC1, entering on Pin 8 and leaving from Pin 7. (See Figure 5-8)

This amplifier gain is about 3dB. Now the 629kHz low converted rotational chroma signal is almost ready to be recorded.

If a black and white signal is being recorded, it is not desirable to allow the color circuits to record any information on the tape. If this were allowed, noise produced by the color circuit may cause interference with a portion of the luminance signal.

In the color mode, the cathode of D3 is held high by Q5 which is turned on by ACK IN from Pin 10 of IC3.

This allows the chroma signal to pass to Pin 8 of IC1. In the black and white mode, Q5 is turned off, and the cathode of D3 is grounded through R27, grounding the chroma signal.

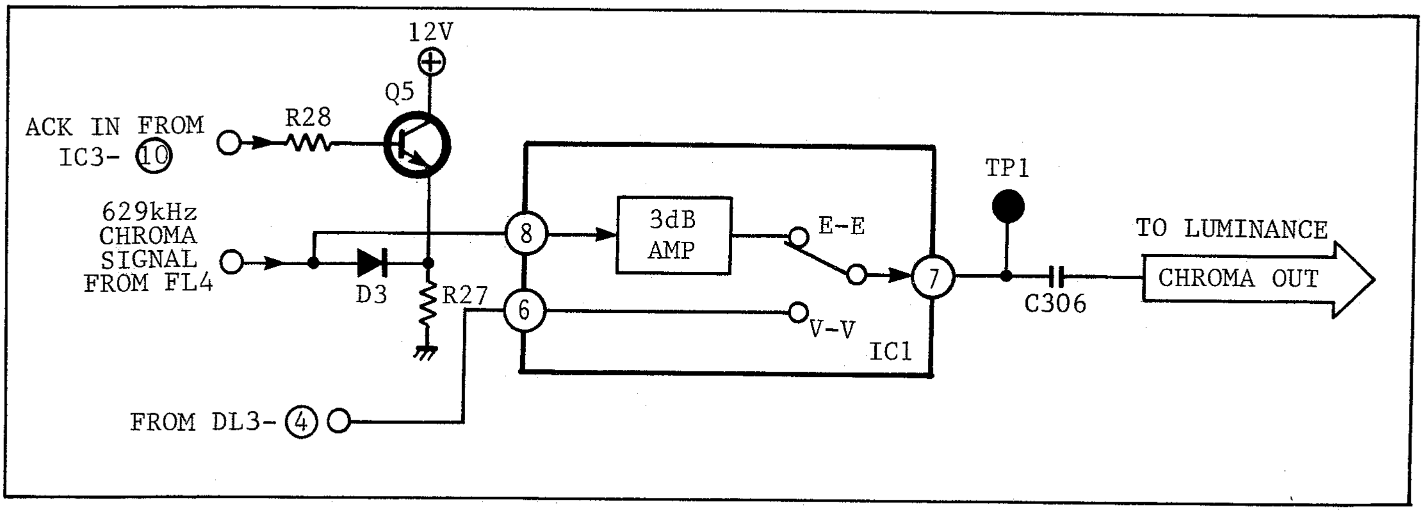

12V
Q5
ACK IN FROM IC3- ⑩
R28
629kHz CHROMA SIGNAL FROM FL4
D3
R27
FROM DL3- ④
8
6
3dB AMP
E-E
V-V
7
IC1
TP1
C306
TO LUMINANCE
CHROMA OUT

Figure 5-8. ACK and 3dB Up.

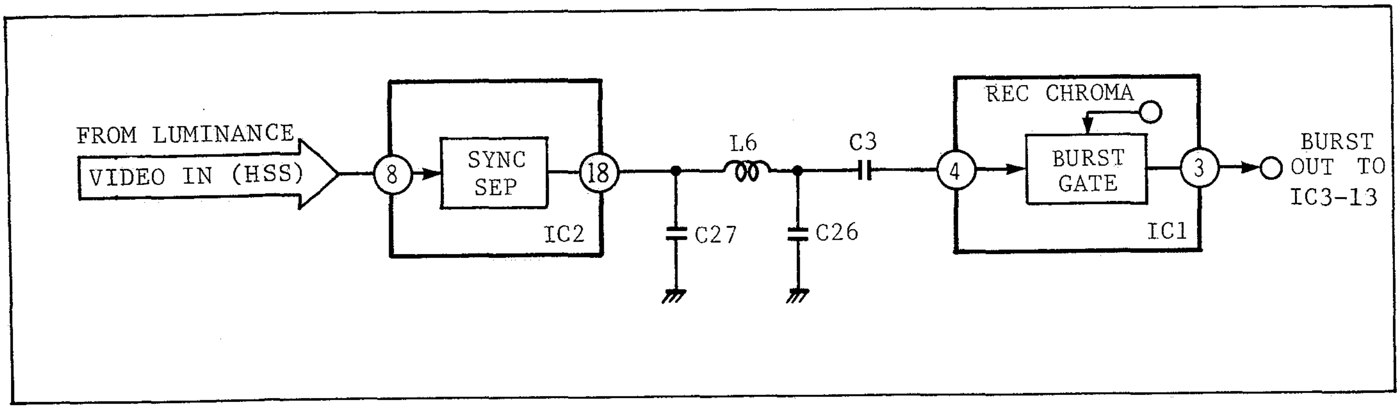

FROM LUMINANCE
VIDEO IN (HSS)
8
SYNC SEP
18
IC2
L6
C3
C27
C26
4
REC CHROMA
BURST GATE
3
IC1
BURST OUT TO IC3-13

Figure 5-9. Burst Gate Pulse.

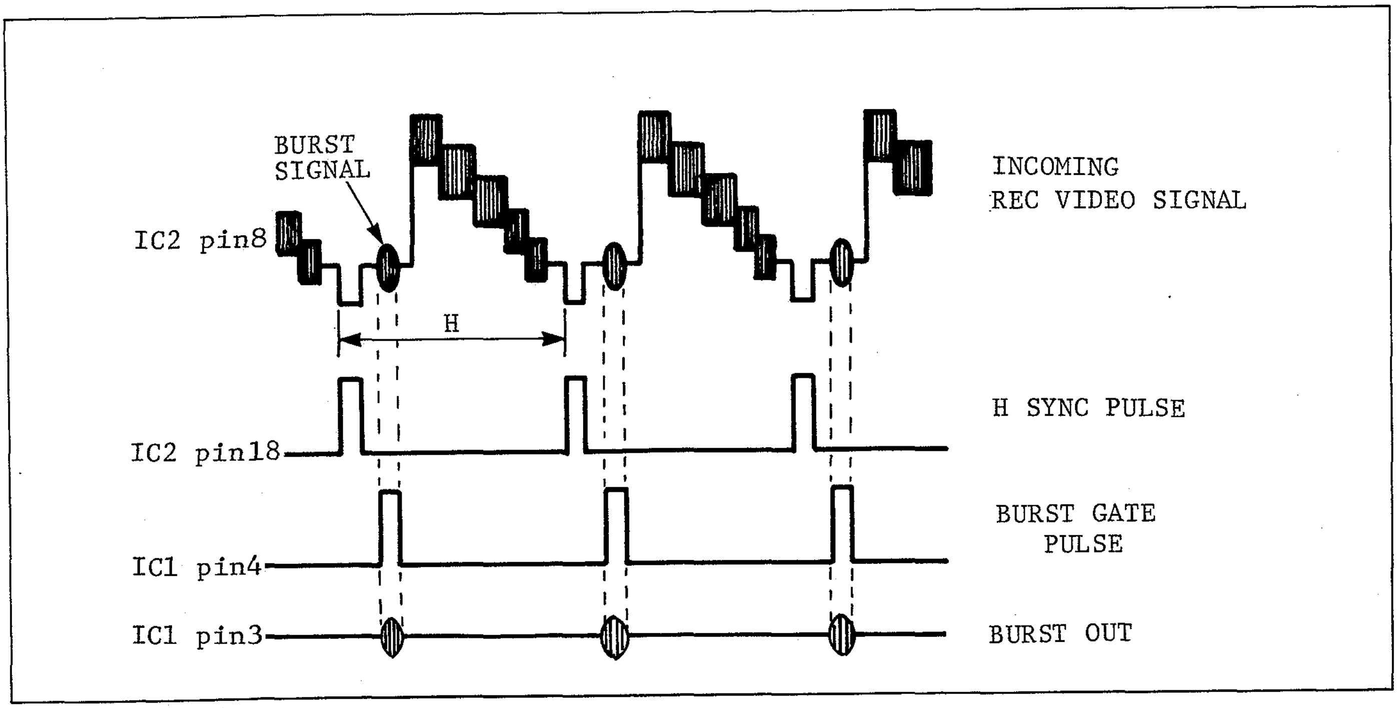

BURST SIGNAL
IC2 pin8
H
INCOMING REC VIDEO SIGNAL
IC2 pin18
H SYNC PULSE
IC1 pin4
BURST GATE PULSE
IC1 pin3
BURST OUT

Figure 5-10. Burst Gate Pulse Timing Chart.

BURST GATE PULSE GENERATOR

The burst gate pulse is a pulse train signal whose positive going pulses are coincident with the burst portion of the chroma signal. It is used through the color circuit so that the burst signal can be separated from the chroma signal. The video output signal is supplied to Pin 8 of IC2. Figure 5-9. Internal to IC2 is a composite sync separator. The output of the composite sync separator is then sent to Pin 4 of IC1 through delay circuit C26, C27 and L6, so that the Burst Gate Pulses coincide with the burst signal as shown Figure 5-10.

DERIVATION OF THE 4.2MHz ROTATIONAL SIGNAL

The development of the 4.2MHz rotational signal utilizes most of the circuitry of the chrominance board. Since the 4.2MHz signal is phase-locked to the incoming video signal, two comparator circuits, AFC and APC, are used as phase-locked loops. In brief, the AFC circuit produces a 2.517MHz signal which is counted down and converted into a 629kHz rotational signal. The APC circuit generates a 3.58MHz signal which when multiplied by the 629kHz rotational signal inside a balanced modulator, will produce the

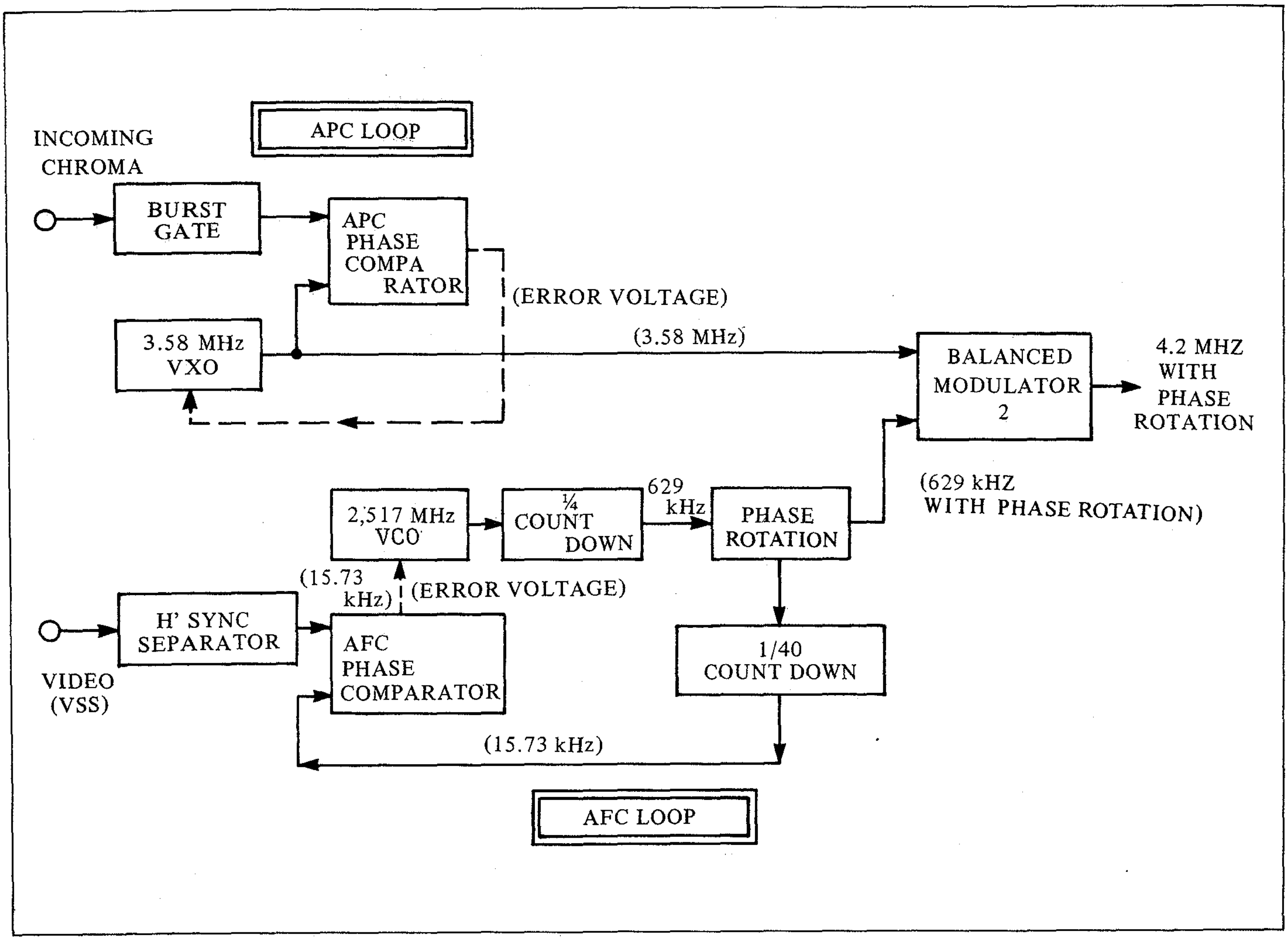

APC LOOP
INCOMING CHROMA
BURST GATE
APC PHASE COMPARATOR
(ERROR VOLTAGE)
3.58 MHz VXO
(3.58 MHz)
BALANCED MODULATOR 2
4.2 MHZ WITH PHASE ROTATION
(629 kHZ WITH PHASE ROTATION)
2,517 MHz VCO
¼ COUNT DOWN
629 kHz
PHASE ROTATION
(15.73 kHz)
(ERROR VOLTAGE)
H' SYNC SEPARATOR
AFC PHASE COMPARATOR
VIDEO (VSS)
1/40 COUNT DOWN
(15.73 kHz)
AFC LOOP

Figure 5-11. APC & AFC.

desired 4.2MHz rotational signal. This simplified description is illustrated in Figure 5-11.

The AFC circuit locks to the incoming horizontal sync signal, and produces a 2.517MHz output signal. This signal is then sent to the rotary generator circuit which produces a 629kHz rotational signal.

Again, "rotational" indicates a phase change of 90° per horizontal line. The APC circuit locks to the incoming burst signal and produces a continuous 3.58MHz output signal. The 629kHz rotational signal and the 3.58MHz signal are combined in a balanced modulator 2, and the output is a 4.2MHz rotational signal. This 4.2MHz rotational signal is the signal that is used in balanced modulator 1 inside of IC1.

AFC

The AFC and rotary generator circuits function together. This operation will now be described.

The AFC circuit, inside of IC2, consists mainly of a 2.517MHz VCO, and a phase comparator. (See Figure 5-12)

One section inside IC2 produces four simultaneous square wave outputs, each at 629kHz, at 0°, 90°, 180°, and 270°. The 0° signal is itself divided down to 15.734kHz. This signal is sent as one input to the AFC phase comparator.

The other input to the phase comparator is the pulse signal which is derived from the incoming video signal. Therefore, the 629kHz signal in IC2 is phase locked to the incoming video signal.

Any phase error will produce an error voltage at Pin 16 of IC2 which is filtered by C28, C29 and R36. The filtered DC signal is then sent from the AFC to the VCO, and is adjustable by R37.

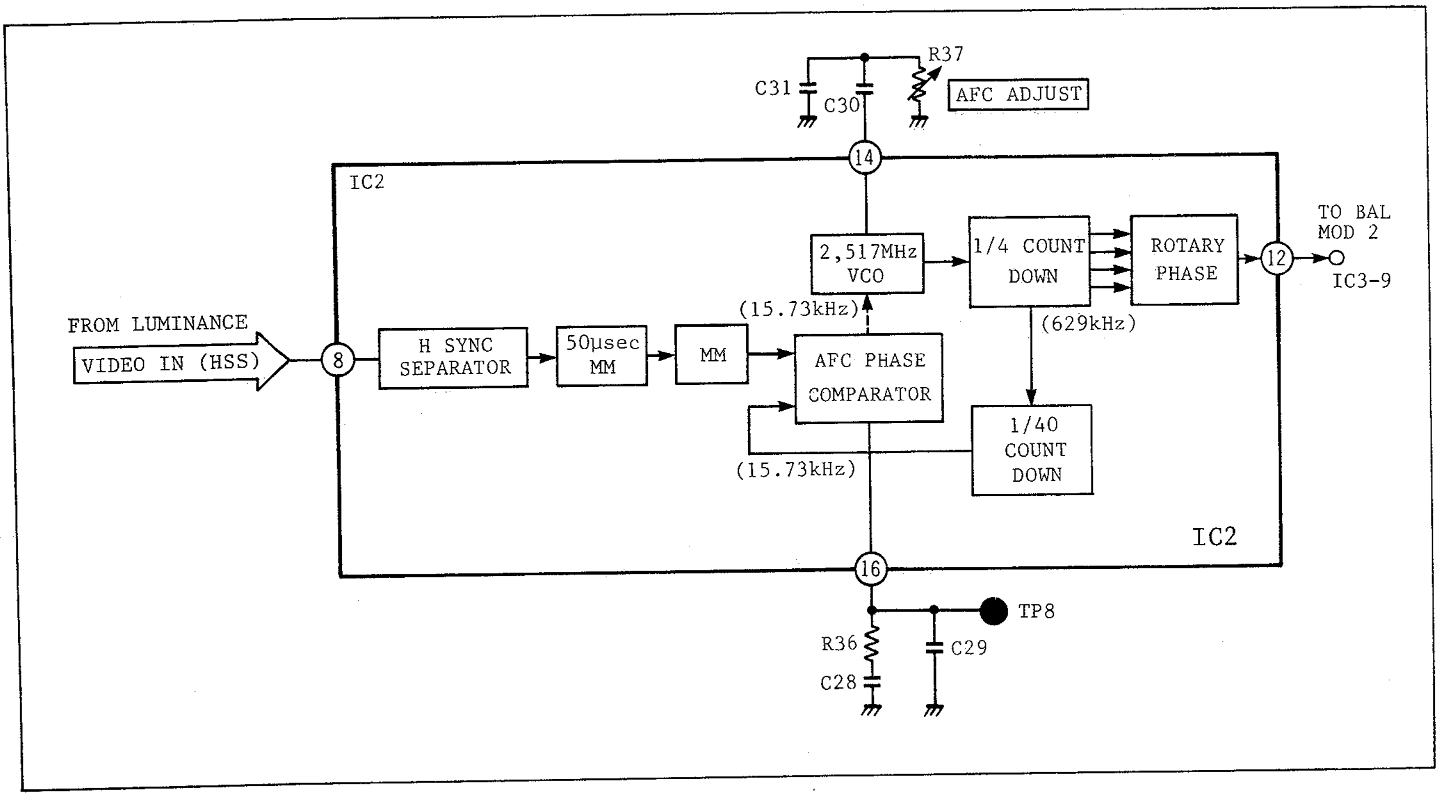

C31
C30
R37
AFC ADJUST
14
IC2
2,517MHz VCO
1/4 COUNT DOWN
ROTARY PHASE
12
TO BAL MOD 2
IC3-9
(15.73kHz)
(629kHz)
FROM LUMINANCE
VIDEO IN (HSS)
8
H SYNC SEPARATOR
50μsec MM
MM
AFC PHASE COMPARATOR
1/40 COUNT DOWN
(15.73kHz)
IC2
16
TP8
R36
C29
C28

Figure 5-12. Rotary Phase Generator.

If the horizontal frequency (fH) signal from the counted down 629kHz signal does not phase match the incoming horizontal sync, an error voltage will be generated and applied to the VCO so that phase matching does occur.

When the AFC circuit is providing the proper phase-locked 2.517MHz signal, the correct 629kHz rotational signal is derived, Figure 5-13 shows an equivalent block diagram of the divide-by-four stage inside IC2. The circuit is essentially a ring counter with one input at 2.517MHz and four 629kHz outputs. Each output is shifted 90° from the adjacent output.

The waveforms of the ring counter are also shown. Since the input 2.517MHz signal is a continuous wave, each output is also continuous. Of course, only one of the 629kHz signals will be used at a time by Balanced Modulator 2. Each of these four outputs is used as one input to its own AND gate of the Rotary Phase Selector Stage (Figure 5-14).

To produce the required phase rotating output, the AND gates must be fired in the following order:

For the first field for video head "A" the firing order is 1-2-3-4.

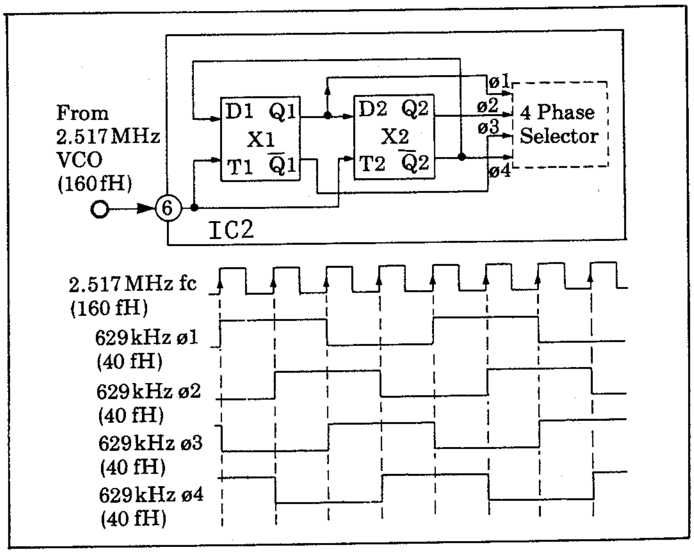

From 2.517MHz VCO (160fH)
6
IC2
D1 Q1
X1
T1 Q̄1
D2 Q2
X2
T2 Q̄2
ø1
ø2
ø3
ø4
4 Phase Selector
2.517MHz fc (160 fH)
629kHz ø1 (40 fH)
629kHz ø2 (40 fH)
629kHz ø3 (40 fH)
629kHz ø4 (40 fH)

Figure 5-13. Divided-by-four Stage.

This provides the desired 0°, 90°, 180°, 270° rotation. For the second field for video head "B", the order is 1-4-3-2. This gives a 0°, 270°, 180°, 90° rotation, which is the same thing as a 0°, minus 90°, minus 180°, minus 270° rotation, which is desired. The gates are fired by the high level of the enabling pulses supplied by the Enabling Pulse Ring Counter circuit (Figure 5-15) also inside IC2.

As shown in Figure 5-15, the fH signal is fed to the fH input. For the first fH pulse, or the first horizontal line of video information, a high signal is present at output one and the rest are low. The succeeding fH pulses will advance the firing as shown in the waveforms of Figure 5-15. When head "B" contacts the tape, the firing order is changed because of the PG pulse input. The firing order for both heads is shown. The final 629kHz rotational signal appears at Pin 12 of IC2 and routed to balanced modulator 2 inside of IC3. The purpose of balanced modulator 2 is to deliver a phase-locked 4.2MHz rotational signal from its 629kHz rotational phase-locked input and its 3.58MHz phase-locked input.

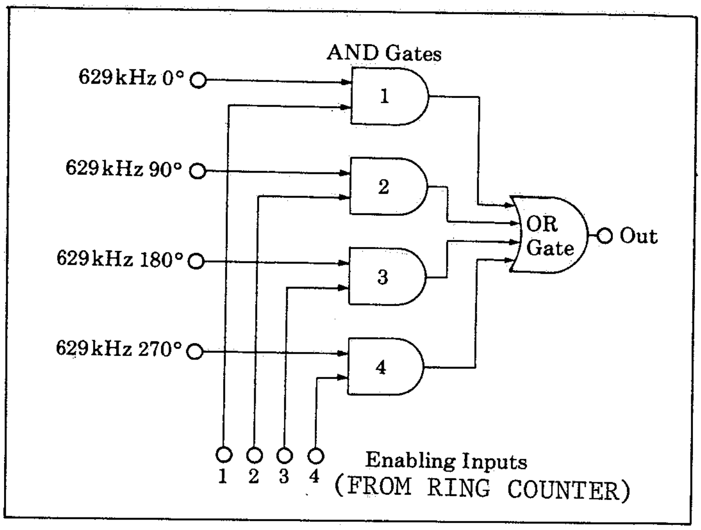

AND Gates
629kHz 0°
629kHz 90°
629kHz 180°
629kHz 270°
1
2
3
4
OR Gate
Out
1 2 3 4
Enabling Inputs
(FROM RING COUNTER)

Figure 5-14. Rotary Phase Selector.

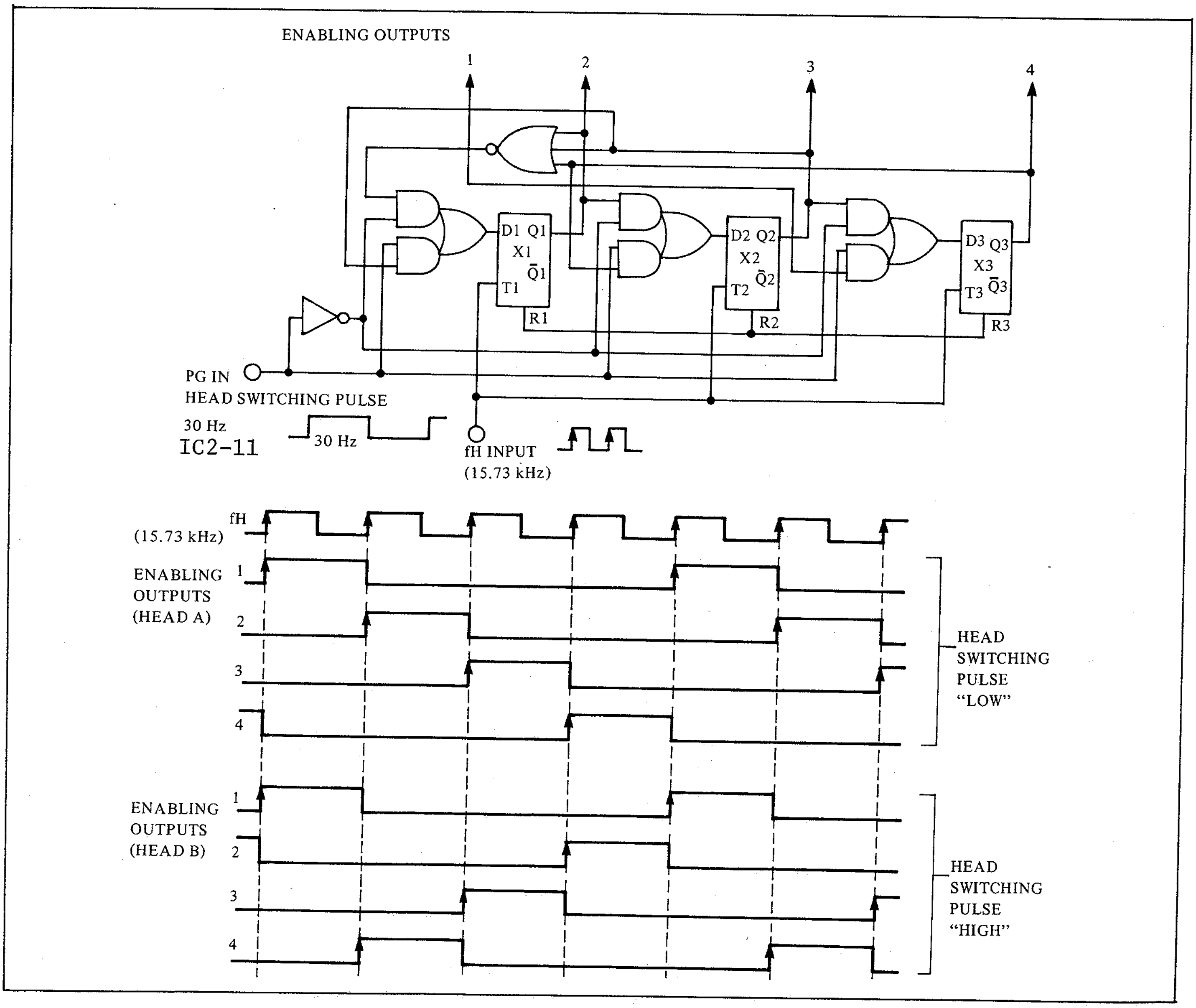

ENABLING OUTPUTS
1
2
3
4
D1 Q1
X1
Q̄1
T1
R1
D2 Q2
X2
Q̄2
T2
R2
D3 Q3
X3
Q̄3
T3
R3
PG IN
HEAD SWITCHING PULSE
30 Hz
IC2-11
30 Hz
fH INPUT
(15.73 kHz)
fH
(15.73 kHz)
ENABLING OUTPUTS (HEAD A)
1
2
3
4
HEAD SWITCHING PULSE "LOW"
ENABLING OUTPUTS (HEAD B)
1
2
3
4
HEAD SWITCHING PULSE "HIGH"

Figure 5-15. Enabling Pulse Ring Counter.

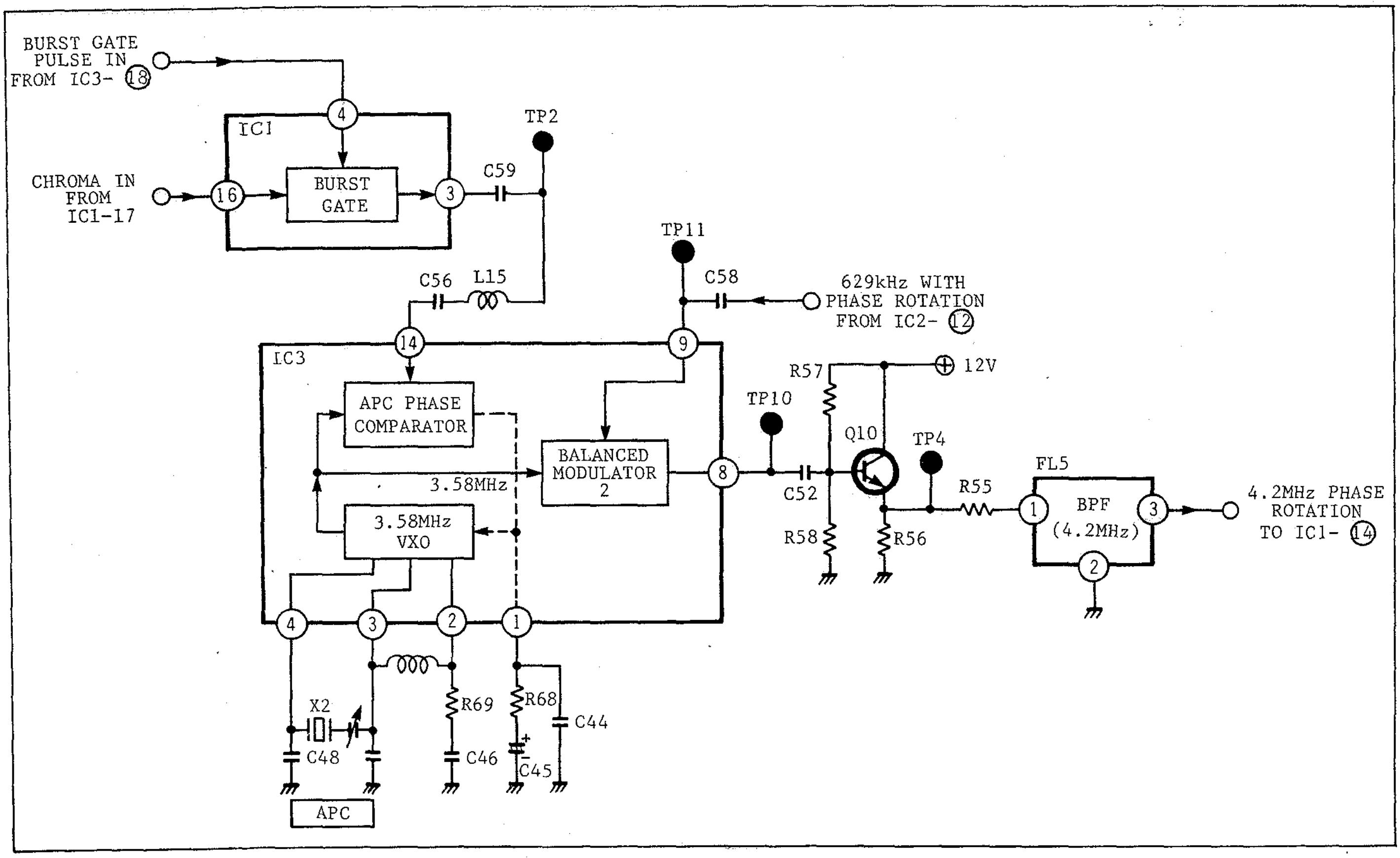

BURST GATE PULSE IN FROM IC3- ⑱
IC1
BURST GATE
CHROMA IN FROM IC1-17
TP2
C59
TP11
C56
L15
C58
629kHz WITH PHASE ROTATION FROM IC2- ⑫
IC3
APC PHASE COMPARATOR
3.58MHz
BALANCED MODULATOR 2
3.58MHz VXO
R57
12V
TP10
Q10
TP4
FL5
C52
R55
BPF (4.2MHz)
4.2MHz PHASE ROTATION TO IC1- ⑭
R58
R56
X2
R69
R68
C44
C48
C46
C45
APC

Figure 5-16. 4.2MHz Phase Rotational Signal.

APC

The other input to balanced modulator 2 is the 3.58MHz signal developed in the APC circuit of IC3. (See Figure 5-16). The APC circuits lock up to the incoming color burst signal. The color signal is gated so that only the burst is passed, and the 3.58MHz signal generated by IC3 is compared against the burst so the phase-lock can be obtained.

The color burst signal, is supplied to the APC phase comparator as one input through a 90° shifter consisting of C56 and L15.

The other input of the APC phase comparator is the 3.58MHz VXO inside of IC3. It produces a continuous wave 3.58MHz signal, governed by X2 and the control voltage applied to this crystal from the APC comparator.

The comparator stage has two current switches and one differential amplifier. If any difference between the phases of the reference and generated 3.58MHz signals is measured, an error voltage will be produced at Pin 1 of IC3, filtered by R68, C44 and C45, and used to drive the VXO in the necessary direction to correct the difference.

The output of the VXO is a continuous 3.58MHz sine wave used in balanced modulator 2.

BALANCED MODULATOR 2

The APC output and the AFC output are sent to the BALANCED MODULATOR 2 inside of IC3.

The APC output is the 3.58MHz signal which is phase locked with the burst signal of the incoming video. The AFC output is the 629kHz signal with rotary phase.

The output contains the sum and difference of the two input signals. The sum is a 4.2MHz rotational signal, and the difference is a 2.95MHz rotational signal. Only the 4.2MHz signal is selected by B.P.F (FL5) and sent to BALANCED MODULATOR 1.

COLOR KILLER

The color killer circuit inside of IC3 detects the presence of the burst signal and the accuracy at which the APC circuit follows the burst.

If there is no burst signal, the killer detector will not allow an ACK +9V signal to be generated. Likewise, if there is an APC failure,and the APC generated 3.58MHz signal does not follow the burst signal, no ACK voltage will be generated.

The circuit involving the color killer is shown in Figure 5-17.

The killer phase detector is inside of IC3. One of its inputs at Pin 13 is the incoming burst signal supplied from Pin 3 of IC1, and routed through Q4, Q13 outside of IC1. This is the same source as was used by the APC. The killer phase comparator works in a similar fashion as the APC phase comparator. The phase comparison is between the burst signal and the 3.58MHz VCO.

In the playback mode, this 3.58MHz signal is taken from a 3.58MHz, X'tal oscillator within the SERVO CIRCUIT.

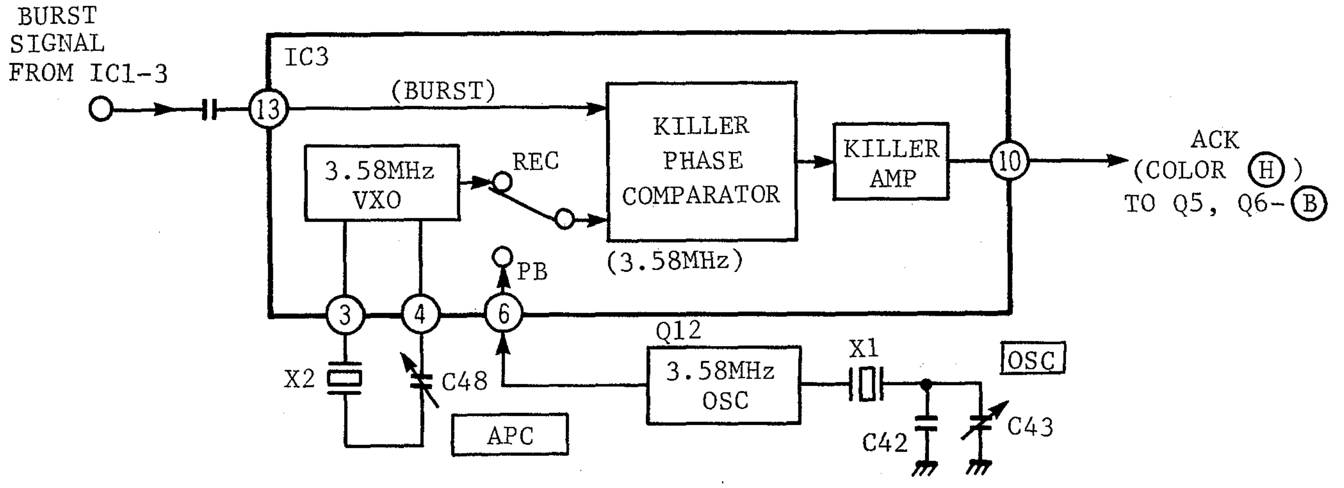

BURST SIGNAL FROM IC1-3
IC3
13
(BURST)
3.58MHz VXO
REC
KILLER PHASE COMPARATOR
KILLER AMP
10
ACK (COLOR H) TO Q5, Q6-B
PB
(3.58MHz)
3
4
6
Q12
3.58MHz OSC
X1
OSC
X2
C48
APC
C42
C43

Figure 5-17. ACK Circuit.

CHROMINANCE PLAYBACK PROCESS

General Description

The simplified block diagram for the Chrominance playback Process is shown Figure 5-18.

ACC

As during recording, ACC is used during Playback to keep the level of the chroma signal constant. The ACC stage gain is adjusted for input level changes using the peak of the gated burst signal.

BALANCED MODULATOR 1

One input to the balanced modulator is the playback 629kHz rotational chroma signal. The other input is the 4.2MHz phase-locked rotational signal, as was used in the record mode, except that it is phase-locked to the playback signal itself. These two signals are inputs to the balanced modulator, and the output, again selected to be the difference (by B.P.F FL3), is a 3.58MHz chroma signal with no rotation and no instability.

BURST ATTENUATION (6dB DOWN)

In the record mode, the burst signal was boosted for an improved S/N ratio. The reverse action, burst attenuation, must be performed in the playback.

3.58 MHz BAND PASS FILTER

As mentioned above, the output of BALANCED MODULATOR 1 consists of sum and difference components between 629kHz signal and 4.2MHz signal.
Band pass filter (FL3) is used to pass the difference component and to eliminate any residual energy above or below the desired chroma band pass. Only information centered at 3.58MHz ± approx. 0.5MHz is allowed to pass as bonafide chroma signals.

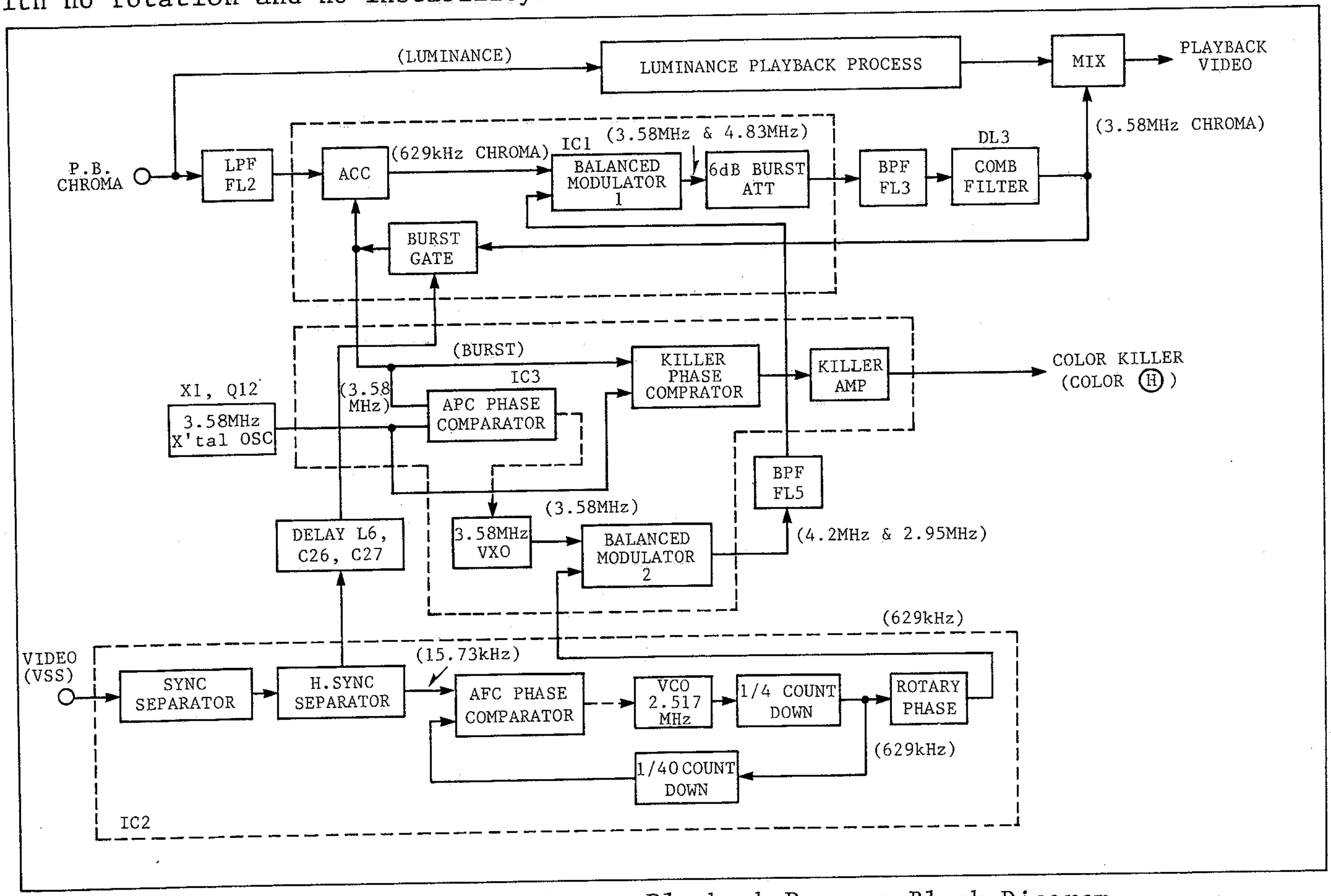

(LUMINANCE)
LUMINANCE PLAYBACK PROCESS
MIX
PLAYBACK VIDEO
(3.58MHz CHROMA)
P.B. CHROMA
LPF FL2
ACC
(629kHz CHROMA)
IC1
(3.58MHz & 4.83MHz)
BALANCED MODULATOR 1
6dB BURST ATT
BPF FL3
DL3
COMB FILTER
BURST GATE
(BURST)
IC3
KILLER PHASE COMPRATOR
KILLER AMP
COLOR KILLER (COLOR Ⓗ)
X1, Q12
3.58MHz X'tal OSC
(3.58 MHz)
APC PHASE COMPARATOR
BPF FL5
(3.58MHz)
DELAY L6, C26, C27
3.58MHz VXO
BALANCED MODULATOR 2
(4.2MHz & 2.95MHz)
(629kHz)
VIDEO (VSS)
(15.73kHz)
SYNC SEPARATOR
H.SYNC SEPARATOR
AFC PHASE COMPARATOR
VCO 2.517 MHz
1/4 COUNT DOWN
ROTARY PHASE
(629kHz)
1/40 COUNT DOWN
IC2

Figure 5-18. Chrominance Playback Process Block Diagram.

COMB FILTER

The comb filter is used to eliminate chroma crosstalk for complete compatibility with other VHS machines.
Using vectors, the chroma phase can be shown at it is put on the tape (Figure 5-19). For field A, or the track recorded by head A, the phase of the color signal is advanced by 90° every horizontal line. Conversely, the phase is delayed by 90° every horizontal line for track B.

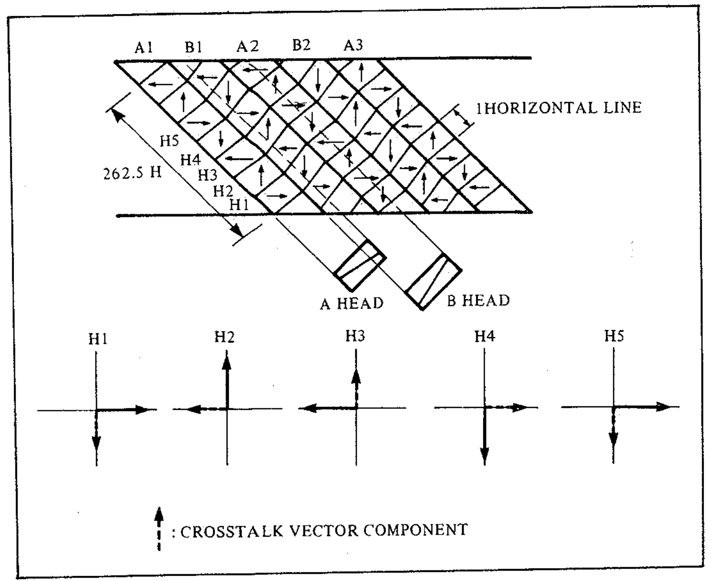


Figure 5-19. Recorded Chroma Signal Crosstalk Vector.

No matter which head (A or B) is used as an example for playback, it will pick up information from the adjacent track. The vectorial representation of this playback signal is also shown below.
Notice that the small vectors which represent crosstalk are always at 90° from the desired signal.
In playback, the main vectors are rotated to their original 0° phase, and of cause, the crosstalk vectors rotate with them.
The phase-restored signal has a crosstalk component which between any two adjacent lines is 180° out of phase.
With this in mind, the comb filter can be built.
The action of spliting the phase restored signal, delaying one path and then adding the two paths together again is basic comb filter action. (See Figure 5-20).
Adding the 1H delayed signal to the undelayed signal places the crosstalk vectors out of phase and they cancel.

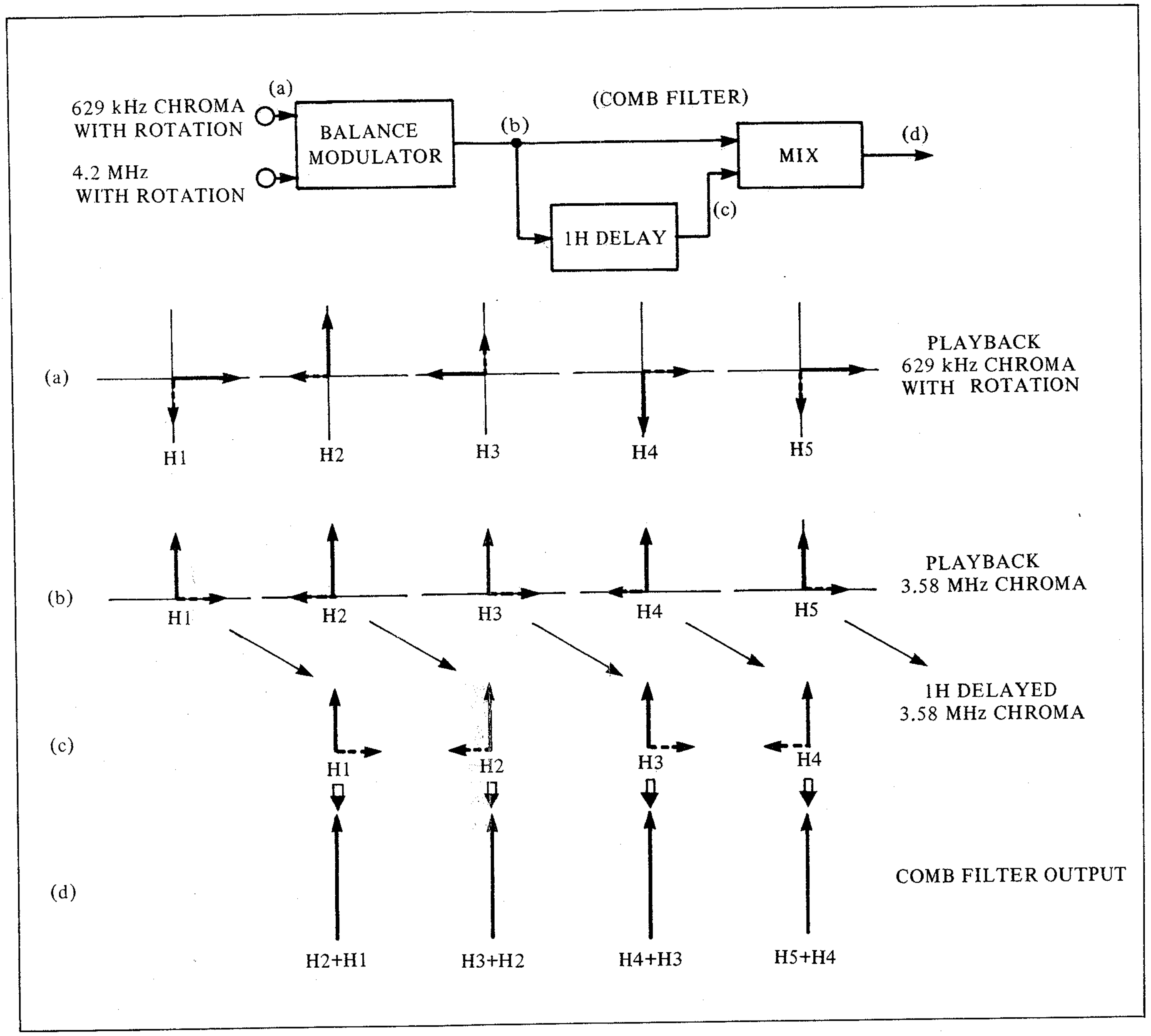


Figure 5-20. Comb Filter.

The desired chroma information, on the other hand, is doubled in amplitude.
Bear in mind that the comb filter works on the premise that the chroma information, and therefore chroma crosstalk, between any two lines in a field is nearly identical, but it is not absolutely identical.
The comb filter adds crosstalk from Line 1 to Line 2, and from Line 2 to Line 3 and so on. The crosstalk signals of Line 1-2, or 2-3 are almost the same, so they cancel to a near perfect zero, but not absolute zero.

The double amplitude chroma signal itself, is not a perfectly double amplitude signal, but nearly perfectly doubled depending upon the difference in signal between adjacent lines. Because of this, some distortion will remain, but since the difference is very, very small, the residual crosstalk and distortion is certainly allowable and is not detectable on the screen. Indeed, if the comb filter were not used, the crosstalk, as seen on the screen, would be objectionable.

AFC-ROTARY PHASE

The AFC Rotary Phase circuits perform the same function in playback as they did in recording, namely to produce a phase-locked, rotational 629kHz signal.
The only difference is that the AFC circuits locks to the playback signal itself, i.e. the playback horizontal sync.
The rotary generator then produces a rotational signal in which the phase changes by 90° per playback horizontal sync pulse.
The actual rotational process is the same as in the record mode.

BURST GATE PULSE GENERATOR

This is the same circuit that was used in recording mode except that it uses the playback horizontal sync to generate its pulse.

APC

The APC circuit in playback still produces a 3.58MHz signal to be used in balanced-modulator 2, but it is not a constant 3.58MHz signal. Its frequency is always fluctuating slightly around 3.58MHz.
This is necessary to produce a rock-solid (phase-locked) 3.58MHz signal out of balanced modulator 1, which will be covered later.

BALANCED MODULATOR 2

Balanced modulator 2 performs the same functions in playback as it did for recording. It supplies a phase-locked, rotational 4.2MHz output from its phase-locked rotational 629kHz input and its 3.58MHz C.W. input.
The only difference is that the 3.58MHz C.W. signal for playback is not a rock-solid or phase-locked signal, but rather a 3.58MHz output plus or minus some small frequency change in order to drive the output of the balanced modulator in the proper direction.
This is explained in the next section.

DELTA FACTOR (Δf)

When any VTR plays back, it is subject to some delta or "wow and flutter". The proper video term to use is "jitter" or "instability". In other words, the VTR machine cannot physically move the tape and spin its video head in exactly the same fashion for playback as it did for recording. It comes close, but it is not perfect.

This is so because the tape itself can change according to ambient conditions such as temperature and humidity. It can stretch, shrink, wrinkle, etc. These factors all contribute to playback jitter.

The playback jitter creates what is designated a delta factor (Δf).

Δf is a "change in frequency", and it means that the playback horizontal sync rate may not be exactly 15.734kHz but rather, at any instant, some small amount above or below it.

Similarly, the chroma signal in playback, is at any moment either 629kHz or some value slightly above or below it (629kHz +Δf).

This is where a problem lies. If the 629kHz +Δf signal were balanced modulated with a 4.2MHz signal, the difference would be 3.58MHz +Δf.

Notice that the Δf still appears in the output. The problem is that most TV receivers will not lock up to a 3.58MHz +Δf signal, but exactly 3.58MHz. The TV set either shows poor or no color. For monochrome operation, the TV receiver is able to use 15.734kHz +Δf, because the more tolerant horizontal circuits in the TV will still produce goods pictures.

This is why the playback chroma signal must have jitter correction while playback luminance signal does not.

The playback AFC/APC simplified diagram below will help explain this (See Figure 5-21).

The object is to produce a rock-solid or phase-locked 3.58MHz chroma signal out of the Chrominance Board. Looking at the AFC section, it can be seen that the AFC network locks up to the playback horizontal sync.

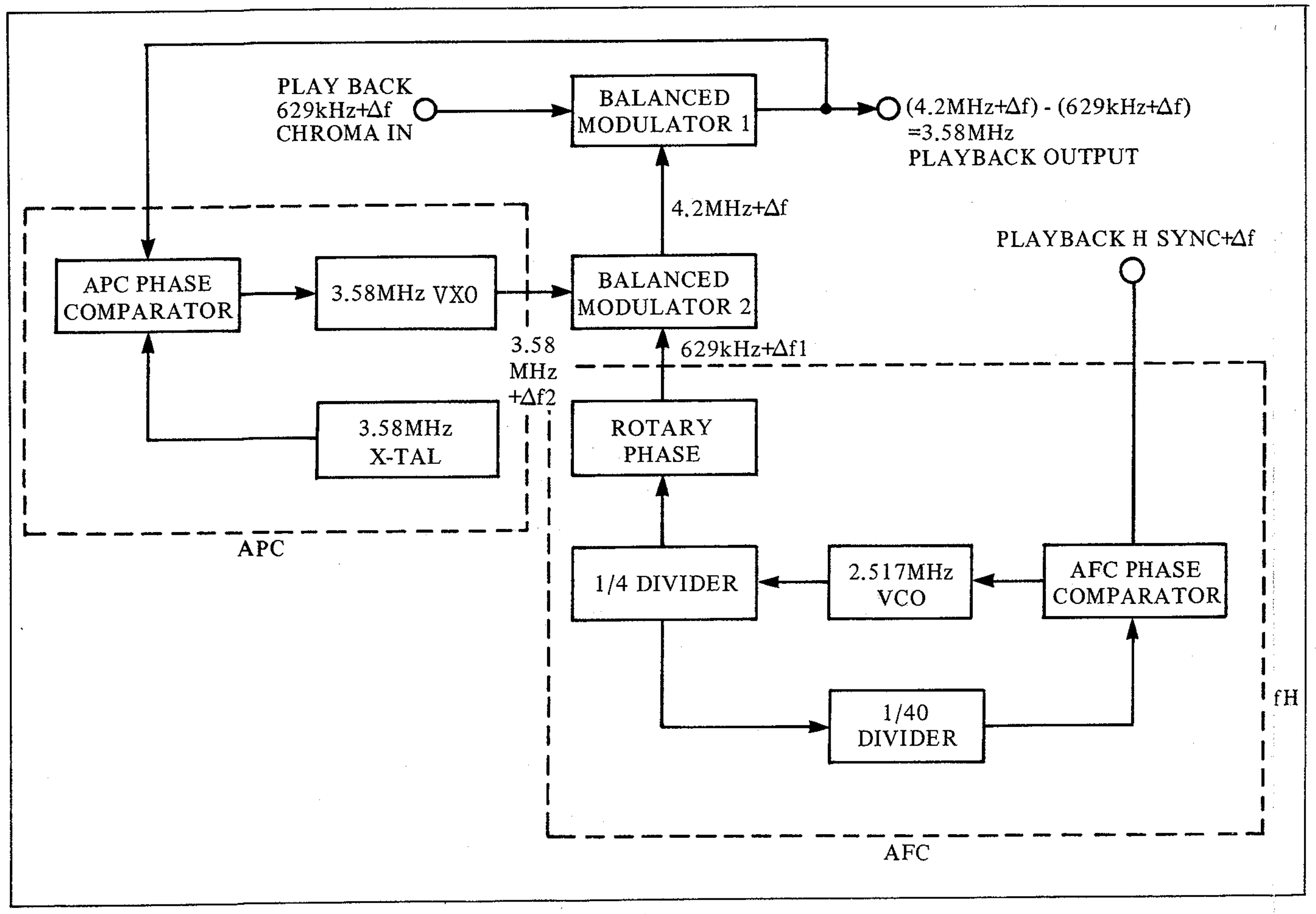

PLAY BACK
629kHz+Δf
CHROMA IN
BALANCED MODULATOR 1
(4.2MHz+Δf) - (629kHz+Δf)
=3.58MHz
PLAYBACK OUTPUT
4.2MHz+Δf
PLAYBACK H SYNC+Δf
APC PHASE COMPARATOR
3.58MHz VXO
BALANCED MODULATOR 2
3.58 MHz +Δf2
629kHz+Δf1
3.58MHz X-TAL
ROTARY PHASE
APC
1/4 DIVIDER
2.517MHz VCO
AFC PHASE COMPARATOR
1/40 DIVIDER
fH
AFC

Figure 5-21. APC & AFC.

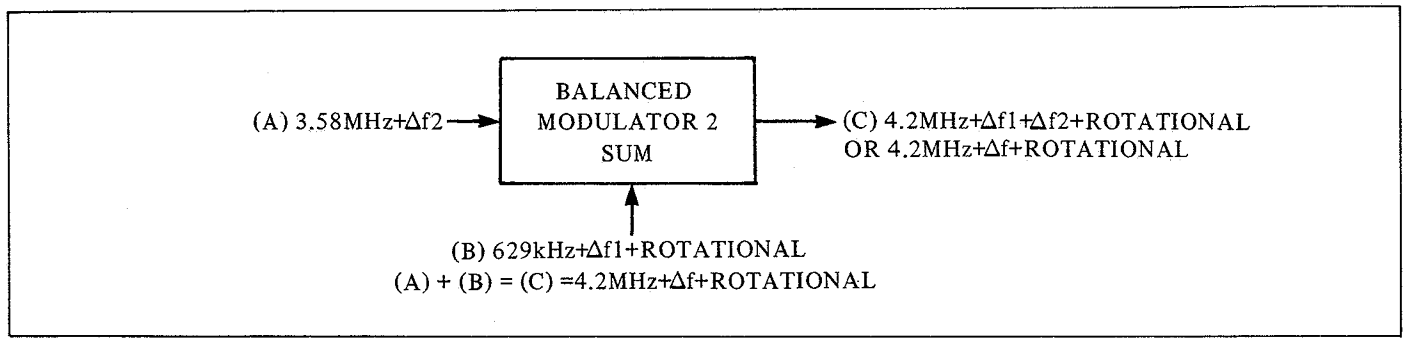

(A) 3.58MHz+Δf2
BALANCED MODULATOR 2 SUM
(C) 4.2MHz+Δf1+Δf2+ROTATIONAL
OR 4.2MHz+Δf+ROTATIONAL
(B) 629kHz+Δf1+ROTATIONAL
(A) + (B) = (C) =4.2MHz+Δf+ROTATIONAL

Figure 5-22. Balanced Modulator 2.

Remember that the playback sync and playback chroma signal both have a Δf component.

When the AFC locks to the 15.734 +Δf signals, it produces a 2.517MHz + (160 Δf) signal (because of multiplication by 160). Then, it is rotated and down converted to a 629kHz + (40 Δf) rotational signal. Now, the jitter component, although changing by small amounts, can change very rapidly. The truth is that the AFC may not accurately follow all of the jitter, so that the rotation signal may be 629kHz + Δf1.

Where Δf1 = (40 ± some small amount) Δf.

Yes, the AFC may itself inaccurately follow the playback Δf to produce its own Δf1, component! This is a fact in ALL VTR's!

This is compensated for by the APC loop. The VCO is driven by a phase comparator which is comparing the actual playback chroma frequency to a stable 3.58MHz source, a cristal.

What the APC loop does is to sense a change in the chroma output away from 3.58MHz and then drive the VCO in the necessary direction to compensate.

For example, assume that the AFC is producing a 629kHz +Δf1 rotational signal and the APC is producing a 3.58MHz signal.

Balanced modulator 2 will accordingly produce a sum signal, or 4.2MHz + Δf1 rotational signal, to be sent to Balanced modulator 1.

The playback 629kHz + Δf rotation signal and the 4.2MHz + Δf1 rotational signal now enter balanced modulator 1, which produces a difference signal, or:

(4.2MHz + Δf1) - (629kHz + Δf) = 3.58MHz + Δf1 - Δf.

Clearly, this is not good enough.

But, if Δf1 + (some other frequency) equalled Δf, the delta factor would be cancelled.

What is needed is a new Δ frequency, Δf2 which when added to Δf1 would equal Δf.

This exactly what the APC loop does. The APC loop will develop a new Δ frequency as necessary to produce a solid 3.58MHz output.

The APC phase detector drives the VCO so that is produces: 3.58MHz + Δf2

Where Δf2 = Δf - Δf1 makes up for the inaccuracies of the AFC loop. Again, balanced modulators add or subtract frequencies, as well as any characteristics of it's input frequencies such as Δf's or phase shifts. (See Figure 5-22 and 5-23)

Balanced modulator 2 is followed by a band pass filter so that only the sum signal passed.

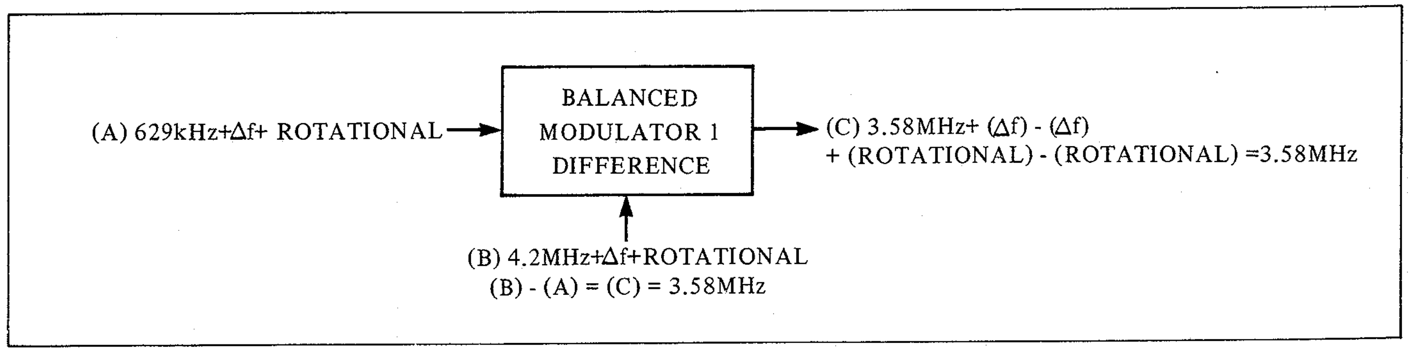

(A) 629kHz+Δf+ ROTATIONAL
BALANCED MODULATOR 1 DIFFERENCE
(C) 3.58MHz+ (Δf) - (Δf)
+ (ROTATIONAL) - (ROTATIONAL) =3.58MHz
(B) 4.2MHz+Δf+ROTATIONAL
(B) - (A) = (C) = 3.58MHz

Figure 5-23. Balanced Modulator 1.

Balanced modulator 1 is followed by a 3.58MHz band pass filter to select just the difference signal in the playback mode.

A lot of operations occur at the same time inside of balanced modulator 1: (Refer to Figure 5-23)

1) Jitter Correction (Δf - Δf = 0).
2) Rotation Correction (Rotation - Rotation = 0).
3) Up Conversion (4.2MHz - 629kHz = 3.58 MHz).

The exact same IC's and circuits are used for AFC/APC playback as were used for recording.

Playback seems much more complex, but it really isn't all that difficult. In the record mode, there was no Δf to worry about, and if there was, the systems would handle it.

Balanced modulator 1 is always subtracting something from the 4.2MHz rotational signal.

In record: 4.2MHz + Rotational - (3.58 MHz) = 629kHz Rotational

Once the reasons for the processes are understood, the process themselves seen much simplier.

Detailed Description

ACC

In order to maintain an overall constant chroma level, playback ACC is used. The same circuit is used for the playback mode as was used in recording.

The main difference is that for playback, the chroma frequency is 629kHz compared to 3.58MHz in record mode.

The low pass filtered video signal enters at Pin (18) of IC1 and sent to the ACC amplifier. The burst gate pulse enters at Pin (4), and functions the same as in the record mode.

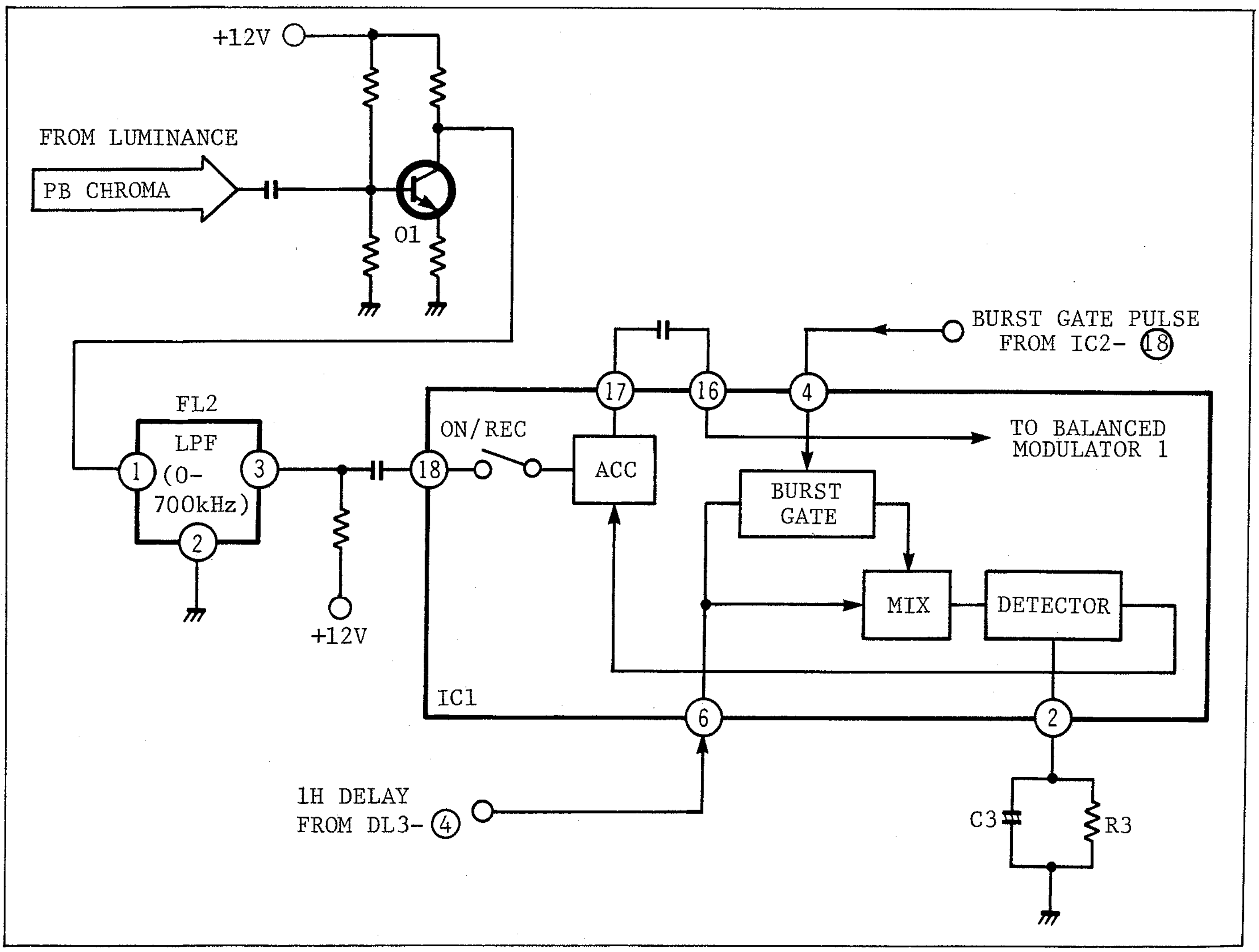

+12V
FROM LUMINANCE
PB CHROMA
01
FL2
LPF
(0-700kHz)
1
2
3
+12V
18
ON/REC
ACC
17
16
4
BURST GATE PULSE FROM IC2- ⑱
TO BALANCED MODULATOR 1
BURST GATE
MIX
DETECTOR
IC1
6
2
1H DELAY FROM DL3- ④
C3
R3

Figure 5-24. Playback ACC Circuit.

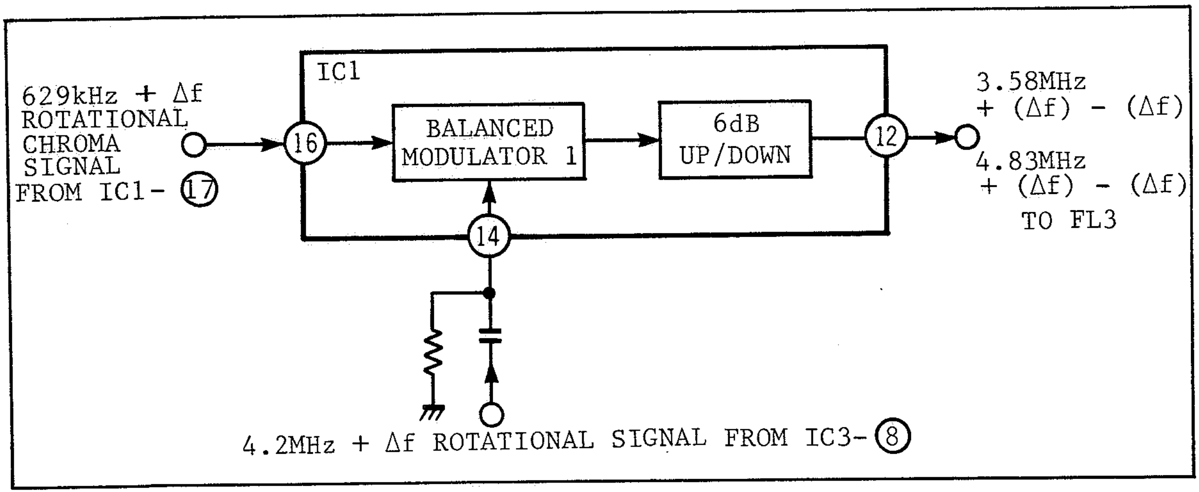

629kHz + Δf
ROTATIONAL
CHROMA
SIGNAL
FROM IC1- ⑰
IC1
16
BALANCED
MODULATOR 1
6dB
UP/DOWN
12
14
3.58MHz
+ (Δf) - (Δf)
4.83MHz
+ (Δf) - (Δf)
TO FL3
4.2MHz + Δf ROTATIONAL SIGNAL FROM IC3- ⑧

Figure 5-25. Balanced Modulator 1.

BALANCED MODULATOR 1

Inside of IC1 (Figure 5-25), balanced modulator 1 will convert the 629kHz rotational unstable chroma signal off the tape to a 3.58MHz non-rotational stable signal. As was explained in the general section, the two inputs to the modulator are the 629kHz signal and a 4.2MHz signal which has the same instability and rotation as the 629kHz signal.
In order to obtain the 3.58MHz non-rotational signal, the rotation of the 4.2MHz signal must be in the same direction as the 629kHz playback chroma. In this way, when the difference signal is selected from the modulator output, the phase and the delta factor are subtracted and cancelled.
The output of balanced modulator 1 is then sent to the 6dB up/down circuit.

BURST ATTENUATION--BPF

The increased burst signal must be attenuated to restore the signal to its proper level.
The 3.58MHz stable signal out of Balanced Modulator 1, appears at Pin 12 of IC1 and is sent to the band pass filter, FL3 (Figure 5-26). This eliminates any energy above or below the desired band pass which could be present.
The 3.58MHz signal then enters at Pin 10 and exits at Pin 9 of IC1 and is sent to the comb filter.

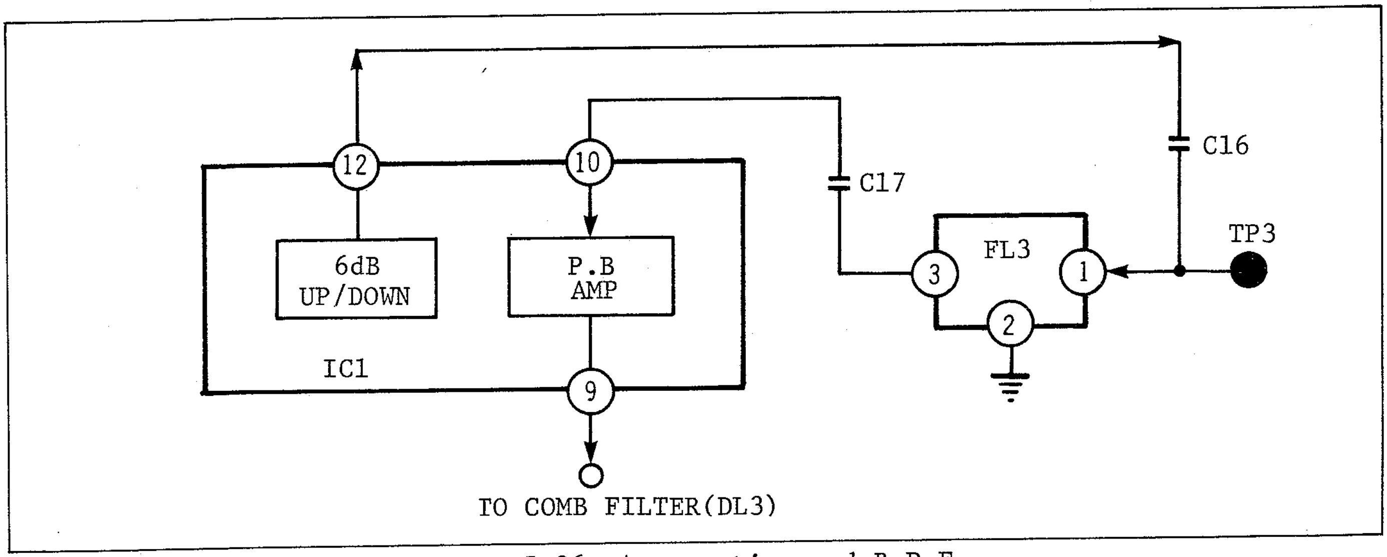

12
10
6dB
UP/DOWN
P.B
AMP
IC1
9
TO COMB FILTER(DL3)
C17
C16
FL3
3
1
2
TP3

Figure 5-26. Attenuation and B.P.F.

COMB FILTER

In order to greatly reduce the chroma crosstalk signals which can occur during playback, a comb filter is used. (See Figure 5-27) The purpose of the comb filter is to add together a delayed and an undelayed chroma signal, which doubles the desired chroma signal and eliminates the crosstalk. The input signal splits into two paths. The delayed path is through R41 and the delay line. The undelayed path, whose level is adjustable by COMB FILTER MIX (R42), goes through R43. The two signals are mixed, then enter at Pin 6 of IC1 and exit at Pin 7 through the REC/PLAY switch.

The input to the circuit (a) and the input to the delay line are the same signal and can be represented by vectors. Referring to waveform (a) in Figure 5-27, the large vectors pointing to the top are the main chroma signals, while the small vectors pointing right and left represent crosstalk. The delayed signal, waveform (b), is then added to (a) to produce waveform (c), a double amplitude chroma signal with no crosstalk (except for the very first and very last lines of a field). The mix control, R42 is adjusted so that waveforms (a) and (b) are of equal amplitude. If they were not of equal amplitude, there would be some residual crosstalk.

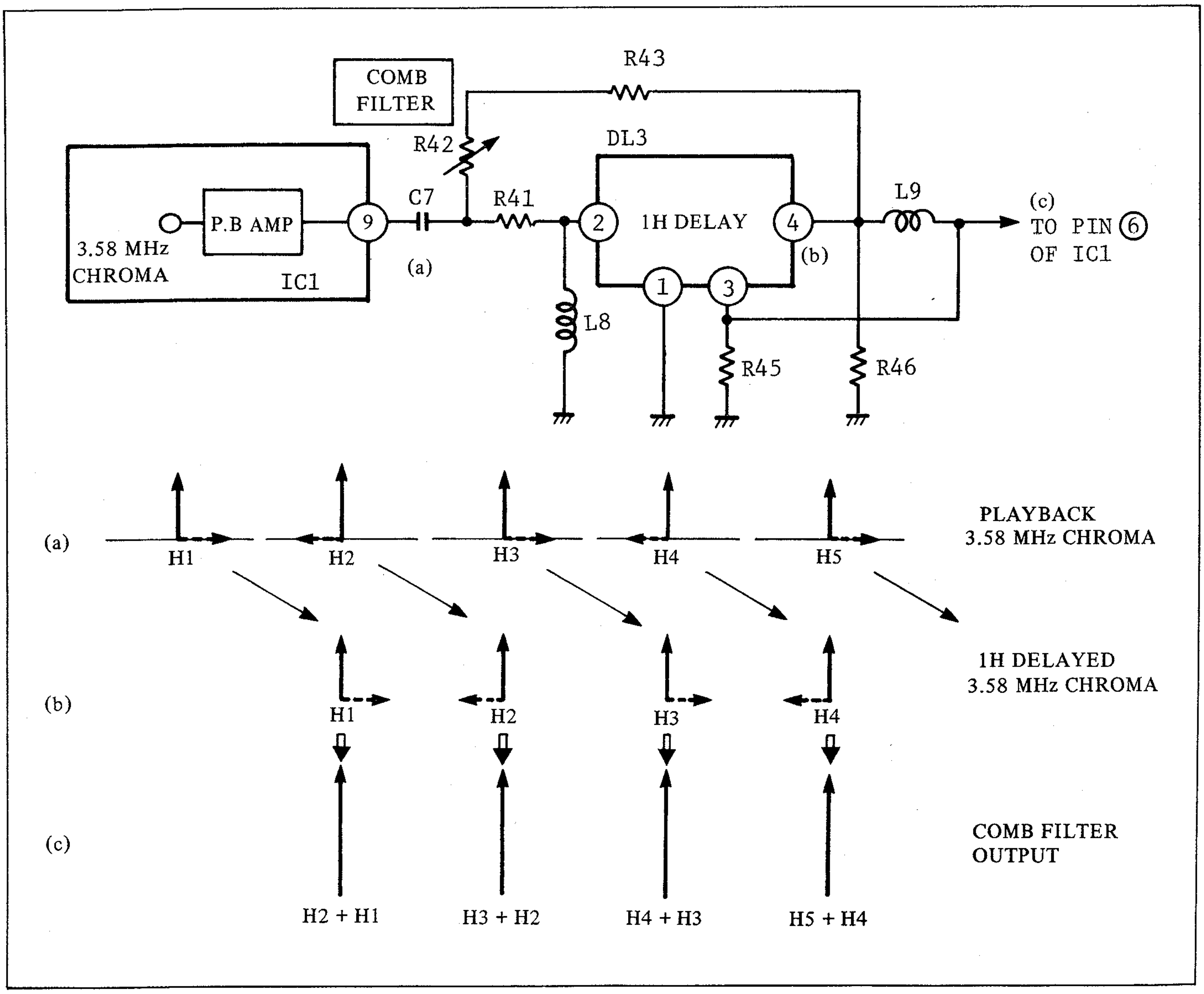

COMB FILTER
R43
R42
DL3
C7
R41
L9
P.B AMP
9
3.58 MHz CHROMA
IC1
(a)
2
1H DELAY
4
(b)
1
3
(c) TO PIN ⑥ OF IC1
L8
R45
R46
(a)
H1
H2
H3
H4
H5
PLAYBACK 3.58 MHz CHROMA
(b)
H1
H2
H3
H4
1H DELAYED 3.58 MHz CHROMA
(c)
COMB FILTER OUTPUT
H2 + H1
H3 + H2
H4 + H3
H5 + H4

Figure 5-27. Crosstalk Cancel.

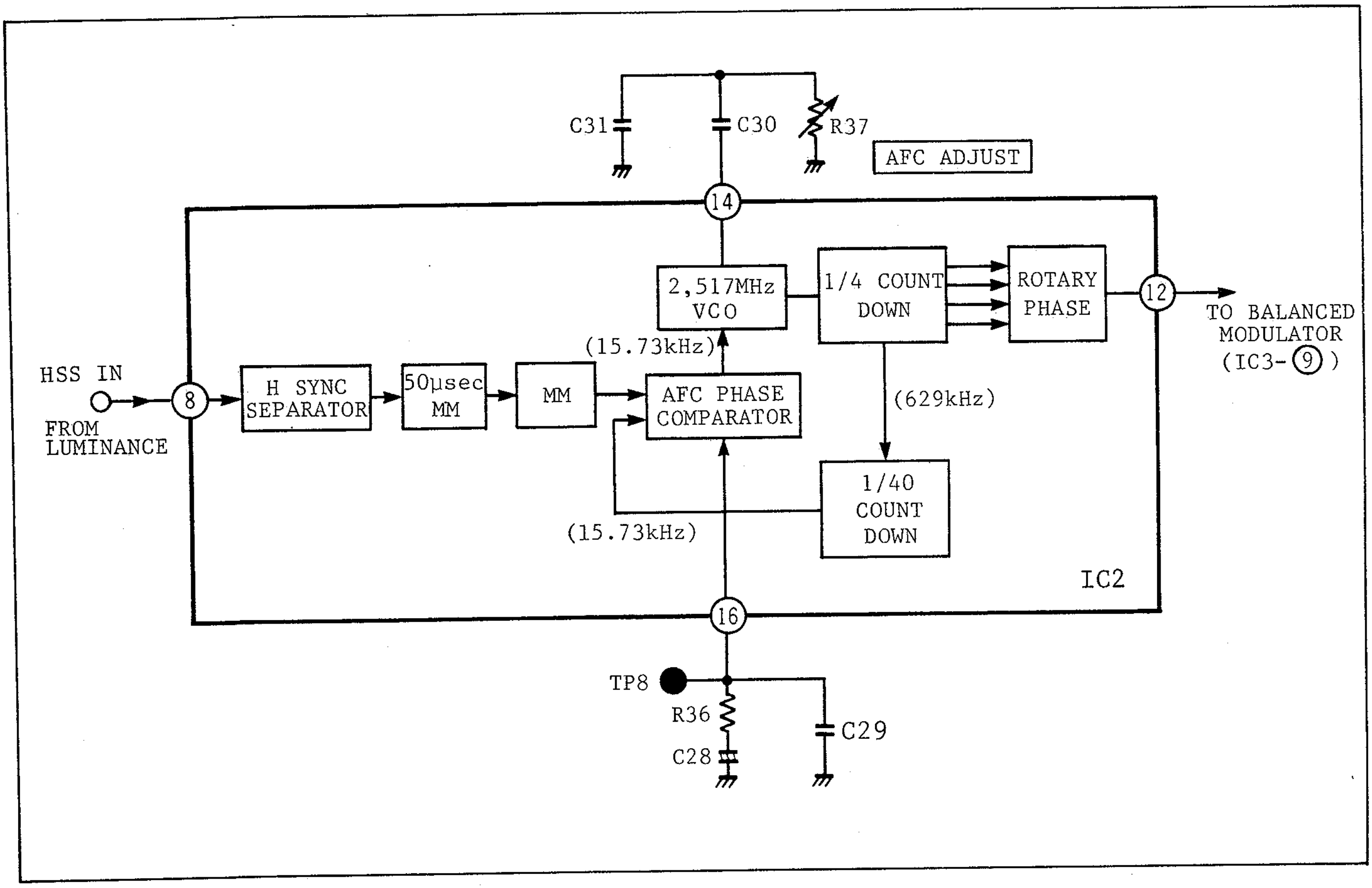

C31
C30
R37
AFC ADJUST
14
2,517MHz VCO
1/4 COUNT DOWN
ROTARY PHASE
12
TO BALANCED MODULATOR (IC3-⑨)
(15.73kHz)
HSS IN
FROM LUMINANCE
8
H SYNC SEPARATOR
50µsec MM
MM
AFC PHASE COMPARATOR
(629kHz)
1/40 COUNT DOWN
(15.73kHz)
IC2
16
TP8
R36
C28
C29

Figure 5-28. AFC Rotary Phase.

AFC-ROTARY PHASE

The AFC functions are identical for both the recording and playback modes. The rotational operation of IC2 as described for the recording mode fully applies to playback mode. The rotary phase generator, and the AFC in IC2 function together as a closed loop, again as in the recording mode. (See Figure 5-28) The only difference in playback is in the HD (Horizontal Drive) signal, which is derived from the playback signal itself.
The fH signal comes from the 1/40 divider to the AFC phase comparator to form the closed loop. The important thing to remember here is that the AFC action will lock the 2.51MHz VCO to the incoming H sync, fH. Therefore, any Δf present in the fH signal will be carried through and be present in the 629kHz rotational output.

APC

The APC circuits will use the actual playback chroma signal. This is fed into Pin (14) of IC3. (See Figure 5-29).
This playback chroma signal is compared against the 3.58MHz crystal oscillator. In the playback mode, the REC/PB switch is switched into the PB mode. Therefore the signal at Pin (6) will be used, which is the 3.58MHz signal from the X'tal, X1.
The APC comparator will develop an error voltage if there is any difference between the reference and the playback chroma signals. This error voltage will drive the 3.58MHz VCO inside of IC3 in the necessary direction so that the difference can be eliminated back in balanced modulator 1. The overall APC circuit functions identically for both the recording and playback modes. However, there is a process that is used in playback that was not desired in the record mode. This is the action which inhibits the burst gate pulse.

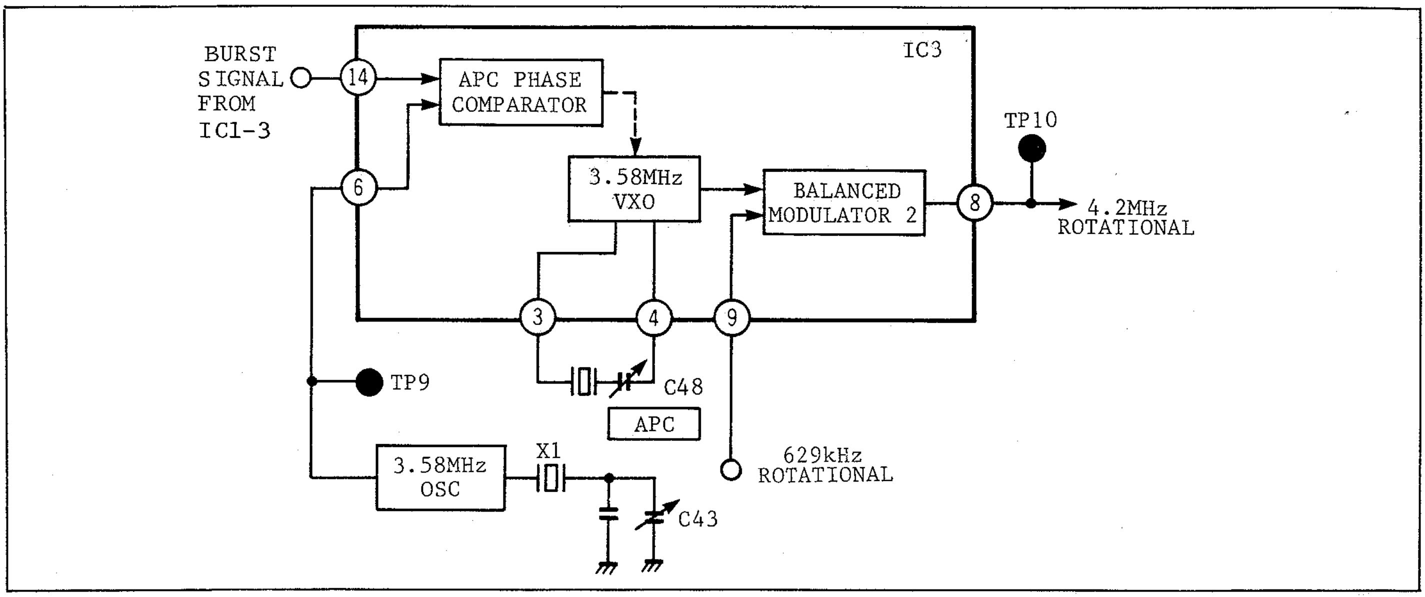

BURST SIGNAL FROM IC1-3
14
APC PHASE COMPARATOR
IC3
TP10
6
3.58MHz VXO
BALANCED MODULATOR 2
8
4.2MHz ROTATIONAL
3
4
9
TP9
C48
APC
3.58MHz OSC
X1
629kHz ROTATIONAL
C43

Figure 5-29. 4.2MHz Rotational Signal.

Note:
In playback, the video heads are constantly being switched ON and OFF. At the point where one head turns ON and the other turns OFF, there is a good possibility of tension or skew error. Remember this is an inherent characteristic of all herical VTR's. The time base shift or instability encountered at this point can be large enough to momentarily upset the APC circuit--cause it to over-react, etc. In this instance, it might take a considerable length of time for the APC to recover. To prevent this from ever happening, the burst gate is turned off, so that it does not pass any burst signals to the APC for about 8 to 9 horizontal lines after head switching.

BALANCED MODULATOR 2

This modulator produces a 4.2MHz rotational signal as in Record mode. It's inputs are the 629kHz rotational CW signal from IC2, and the 3.58MHz signal from X2 VXO. These two input signals have a total Δf equal to that of the signal from the tape. The output is then a 4.2MHz rotational signal with Δf.

ID PULSE

The last function found in playback that is not performed in recording is the ID pulse circuit. (Figure 5-30) In conjunction with APC, the ID pulse senses if the APC circuit has gotten 180° out of phase. APC action itself can track a 90° change, but in the event of playback starting or other disturbances, the APC may get 180° out of phase. The ID circuit will detect this and kick the balanced modulator 2 phase by 180° so that APC lock can again occur. This assures that despite disturbances, the AFC/APC will always quickly retain color lock.

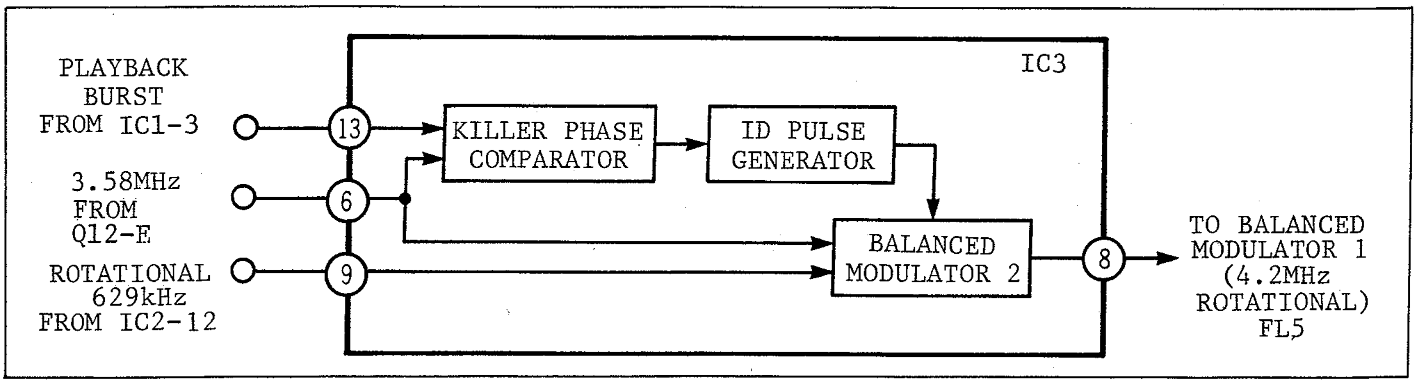

PLAYBACK BURST FROM IC1-3
13
KILLER PHASE COMPARATOR
ID PULSE GENERATOR
IC3
3.58MHz FROM Q12-E
6
BALANCED MODULATOR 2
8
TO BALANCED MODULATOR 1 (4.2MHz ROTATIONAL) FL5
ROTATIONAL 629kHz FROM IC2-12
9

Figure 5-30. ID Pulse.

NORMAL AUDIO CIRCUIT

Introduction

The audio circuit boards are used for normal audio recording and playback modes, and sets the recording bias.
The audio circuit has two channels, CH1 and CH2, which are almost identical.
CH2 can be used for Time Code recording and playback. The audio circuit boards are also used for normal audio output processing, the headphones output, line output and TV 8-pin connector output.

Record Mode

General Description

PREAMPLIFIER

This description will apply to both CH1 and CH2, although diagrams will show only the CH1 components. Channel 2 reference numbers are in parenthesis. If the original signal came from the microphone jack, the signal has been amplified, and the level-controlled signal is sent to the preamplifier inside IC2, (CH2: IC6), then to the DOLBY NR circuit (encoder). See Figure 6-1.

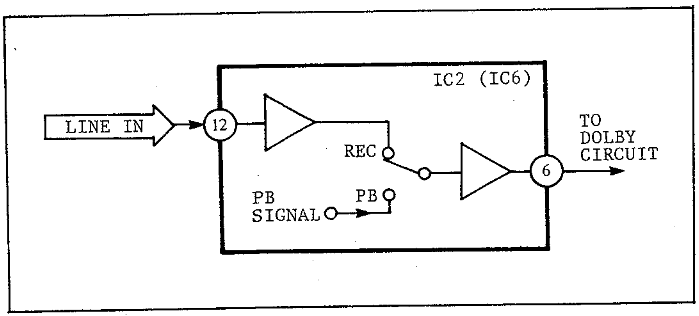


Figure 6-1. Preamplifier.

DOLBY NR CIRCUIT (ENCODER)

The AG-6800 VTR uses the Dolby-B NR system. The system consists of IC3 (IC7), L1 (L4) and other components.
The preamplified signal is applied to pin 5 of IC3 (IC7) where it is encoded with Dolby NR, and the output appears at pin 7 of IC3 (IC7).

PEAKING

The signal after Dolby-B NR processed, or non-processed is controlled by R86 (R160), CH1 (CH2) REC CURRENT, and then is sent to pin 5 (pin 3) of IC11, the noninverting input of an operational amplifier (Figure 6-2). The gain of the amplifier is controlled by the frequency of the input signal.

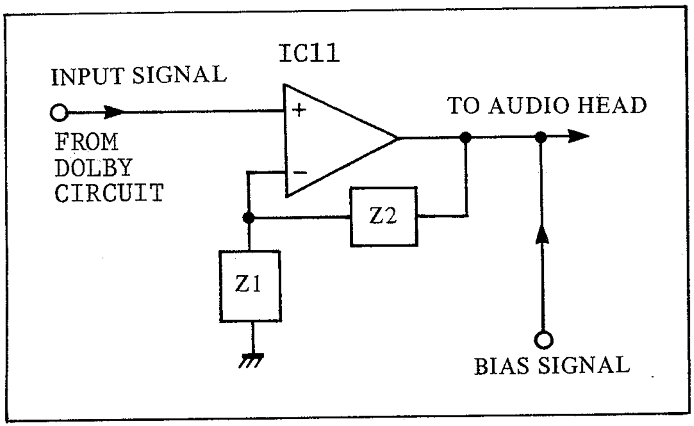


Figure 6-2. Peaking Circuit.

Z1 represents high frequency peaking and Z2 represents low frequency peaking.
The total peaking characteristics of the recording frequency is shown in Figure 6-3.

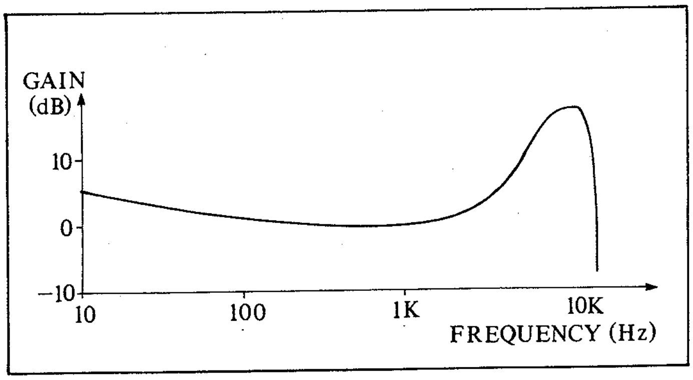


Figure 6-3. Recording Mode Frequency Characteristic.

BIAS AND ERASE OSCILLATOR

A 70kHz signal is also developed on the audio board by oscillator Q77 and T1.
The oscillator is turned on for the full record mode, or after audio recording for CH1.

The oscillator signal at T1 is directly sent to the audio erase heads of CH1 and CH2.
In addition, full erase is completed by the signal from oscillator Q79 and T2.
In record mode the REC low signal is sent from pin 2 of P4004 to the base of Q80 through the inverter Q110. This turns Q80 on, and the oscillator (Q79, T2) generates the sine wave signal which operates F.E Head.
The A.E circuits turn on by the REC R/P low or DUB R/P low signal through Q81 (for CH1, CH2).

Detailed Description

This description will apply to both CH1 and CH2 although diagrams will be shown only for CH1 components.

PREAMPLIFIER

IC2 is used for both recording and playback. The voltage of Pin 7 determines the recording or playback mode status of the unit.
The REC EE (H) signal is supplied from D71 to Pin 7 so that IC2 can be switched to the recording mode (Figure 6-4). In Record mode, the input signal supplied to Pin 12 of IC2 is amplified, and then sent to the Dolby encoder circuit through Pin 6.

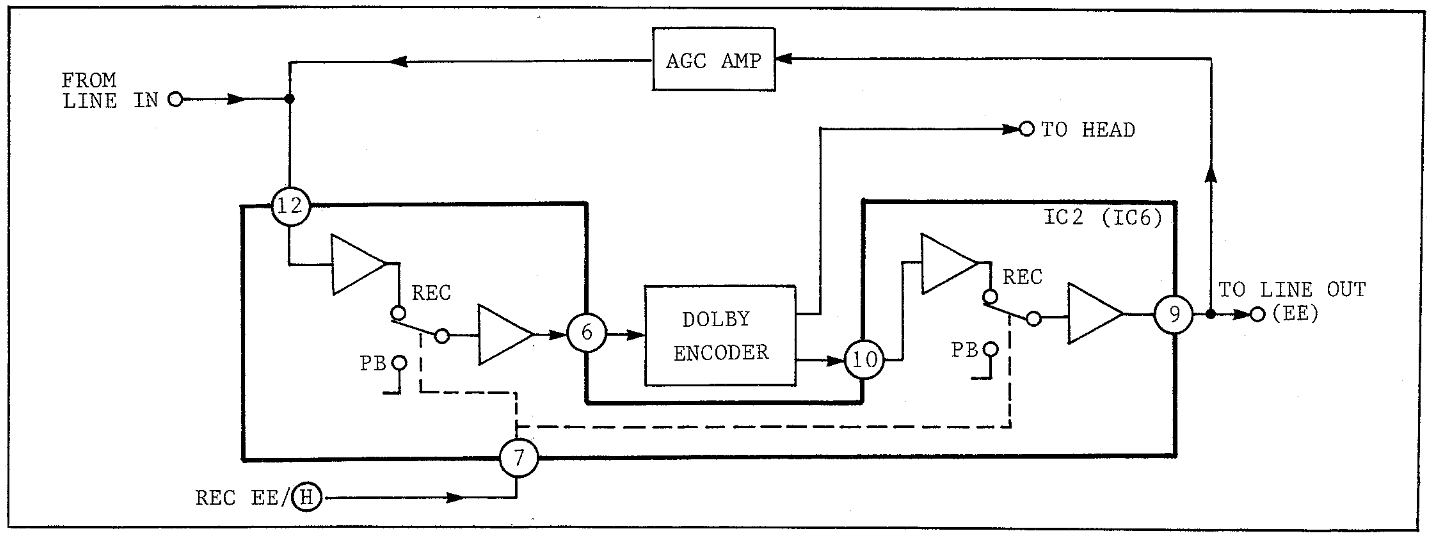


Figure 6-4. Preamplifier Circuit.

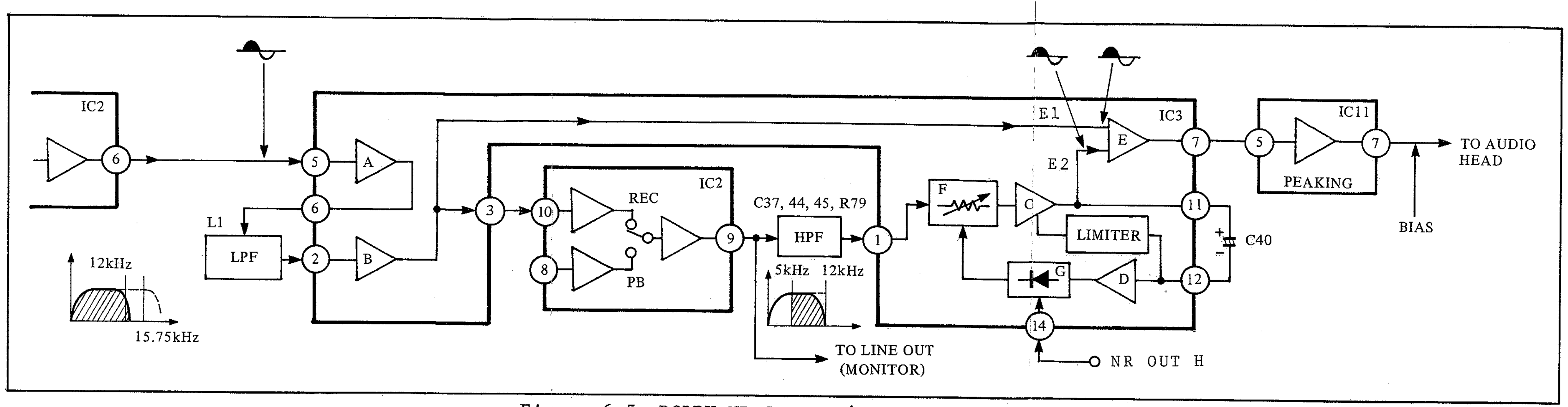


Figure 6-5. DOLBY NR System (REC:Encode Mode).

DOLBY NR CIRCUIT (ENCODER)

IC3 is a Dolby NR processor used for both recording (encode) and playback (decode). The Dolby NR encode circuit is shown in Figure 6-5. The preamplified signal output from Pin 6 of IC2 is supplied to the amplifier (A) between Pins 5 and 6 of IC3. Any 15.75 kHz horizontal sync signal or the 70 kHz audio bias signal (or other high frequency signals) are eliminated by the filter (L1, Dolby NR filter), to allow the Dolby NR circuit to function properly.
The signal (whose high frequency portions are eliminated) is supplied to the amplifier (B) between pins 2 and 3, then supplied to one input of the adder (E) inside IC3, and also exits at pin 3 to be supplied to the amplifier between Pin 10 and Pin 9 inside IC2.

The low frequency portions of the amplified signal are then eliminated by the high pass filter consisting of C37, C44, C45, and R79, and then sent to Pin 1 of IC3.
This signal is supplied to the variable impedance (F). This variable impedance (F) is controlled by a DC voltage converted from the incoming signal level.
The DC voltage is produced by the rectifier (G) through the amplifiers (C) and (D).

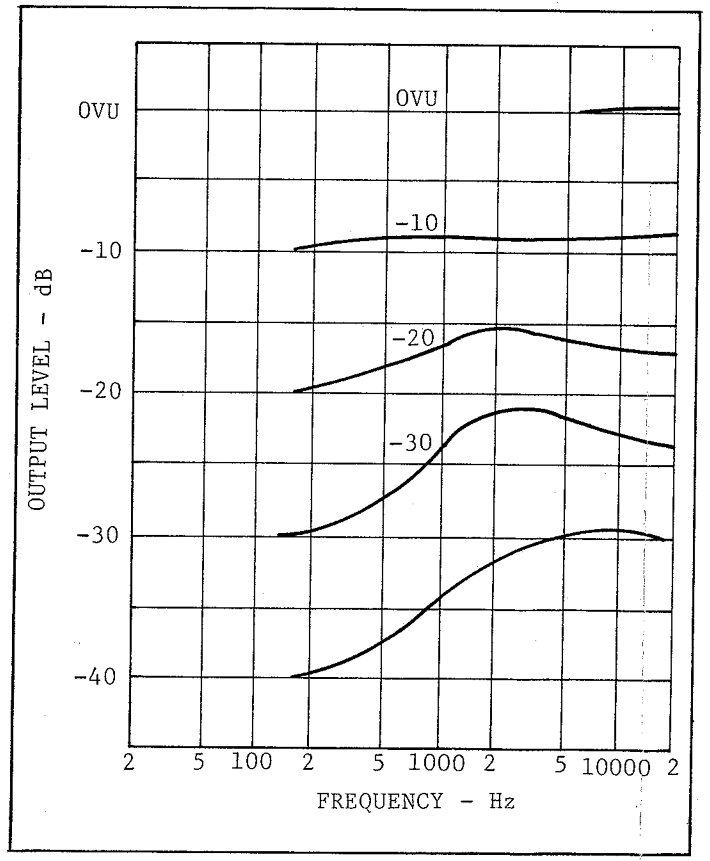
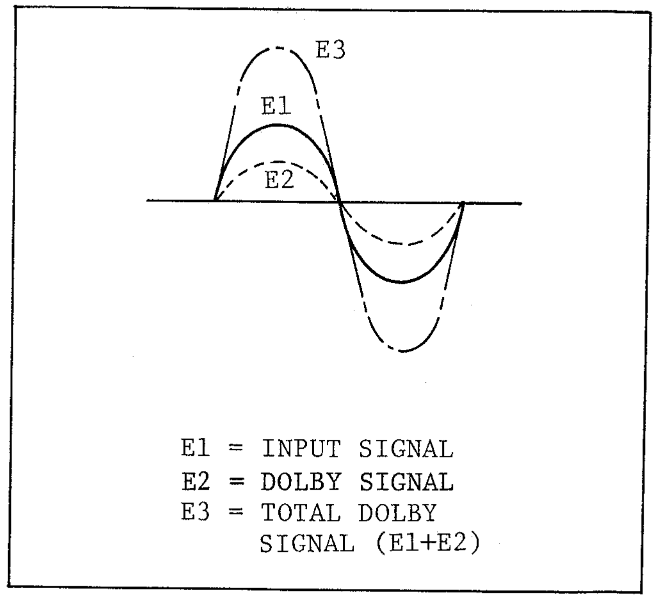


Figure 6-6. Frequency Response of DOLBY Encoder.



E1 = INPUT SIGNAL
E2 = DOLBY SIGNAL
E3 = TOTAL DOLBY SIGNAL (E1+E2)

Figure 6-7. Signal Function of DOLBY Encoder.

If the voltage is low, the gain of the variable impedance (F) is increased, while if it is high, the gain is decreased resulting in a controlled amplitude signal. Any remaining amplitude peaks are clipped by the limiter circuit.
A high DC voltage (+12V) is supplied to Pin 14 of IC3 whenever Dolby NR processing is not selected.
The gain-controlled signal, which is the high frequency portion of the original signal, is supplied to the other input of the adder (E). The two input signals are then mixed and phase inverted (See Figures 6-6, 6-7). The resulting encoded output signal is sent out from Pin 7 of IC3 and supplied to the audio head.

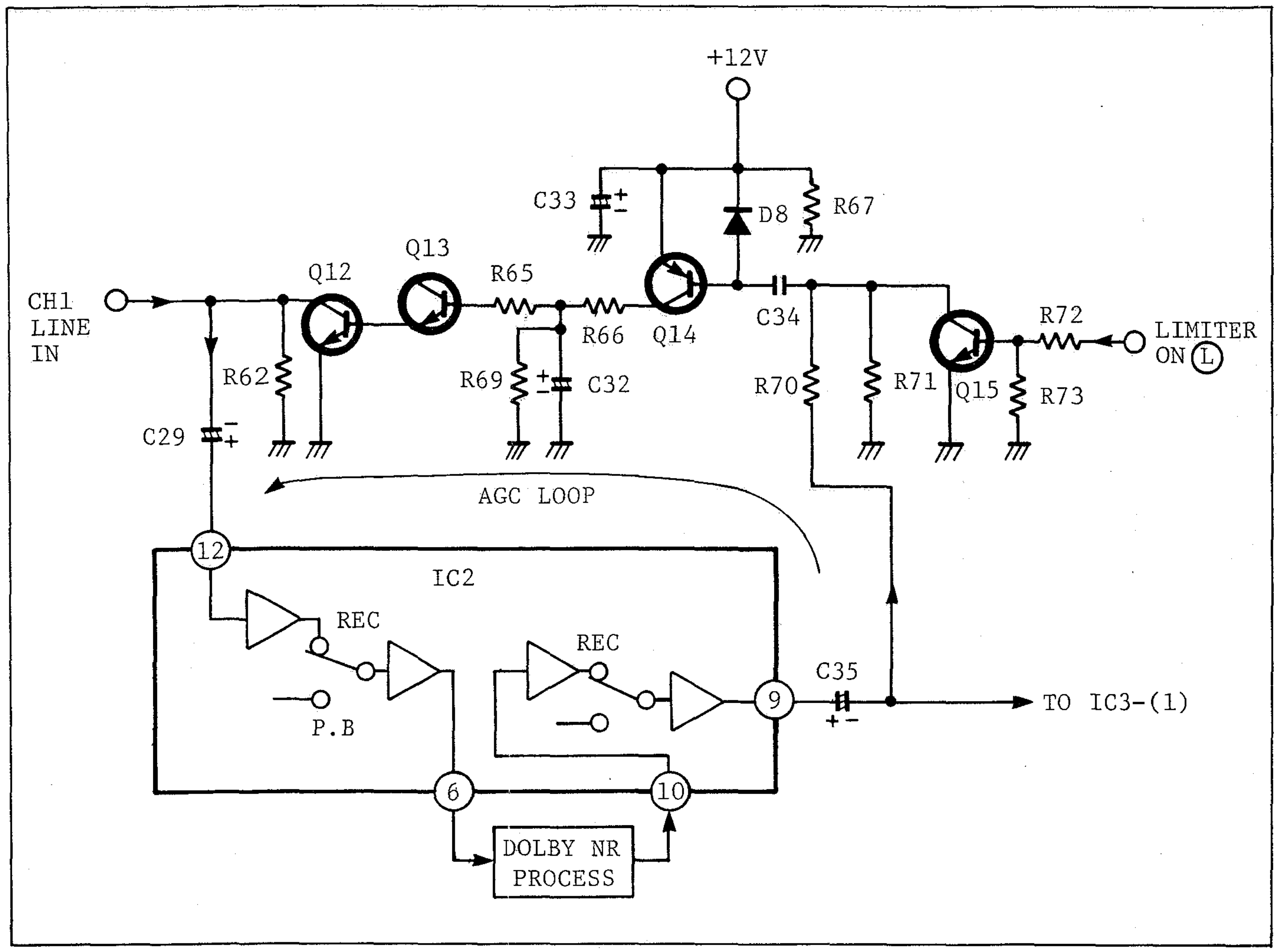

+12V
C33
D8
R67
Q13
Q12
R65
CH1
LINE
IN
R66
Q14
C34
R72
LIMITER
ON Ⓛ
R62
R69
C32
R70
R71
Q15
R73
C29
AGC LOOP
IC2
REC
REC
P.B
C35
TO IC3-(1)
12
9
6
10
DOLBY NR
PROCESS

Figure 6-8. Audio Limiter (AGC) Circuit.

AUDIO LIMITER (AGC)

A Limiter ON Low signal is fed to the base of Q15 from the audio limiter switch on the front panel. Q15 turns OFF for the audio limiter to be actived. The Monitor Out signal from Pin 9 of IC2 is fed to the detection circuit. The signal level is converted to a proportional DC voltage by Q13, Q14 and other components, and fed to the base of Q12. The output of Q12 is applied (via pin 12 of IC2) as a level control voltage to the Record amplifier in IC2. When the limiter switch is in the position, Q15's open collector grounds any singal going to the AGC stage (Q12, 13, 14) and the limiting action is disabled. In this mode of operation, the signal level at IC2, pin 12 is controlled only by the front panel level control.

Playback Mode

General Description

This description will also apply to both CH1 and CH2 although diagrams will show only the CH1 components. The playback signal from audio head CH1 enters Pin 2 of IC2 after passing through connector P4002-Pin 3.

PB AMP & EQ

The signal is supplied to the amplifier between Pins 2 and 6 of IC2 (Figure 6-10). The amplifiers inside IC2 are operational amplifiers which have two inputs, non-inverted and inverted. The playback equalizing and gain control operations use the inverted input.

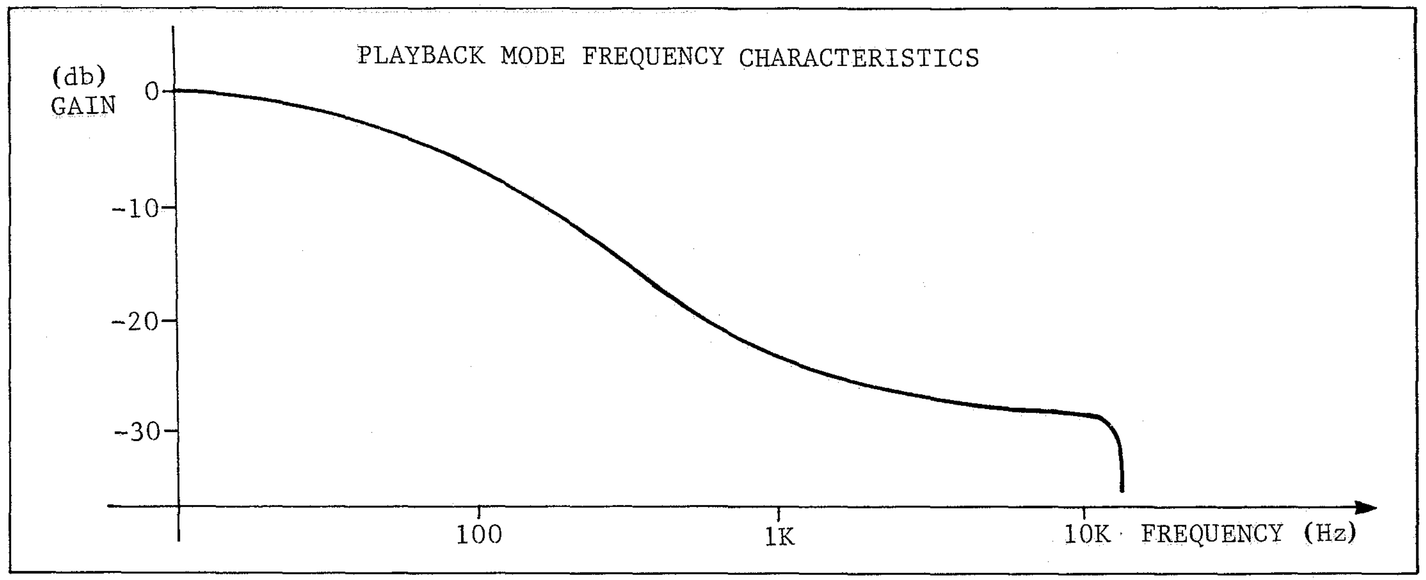


Figure 6-9. Playback Frequency Characteristic.

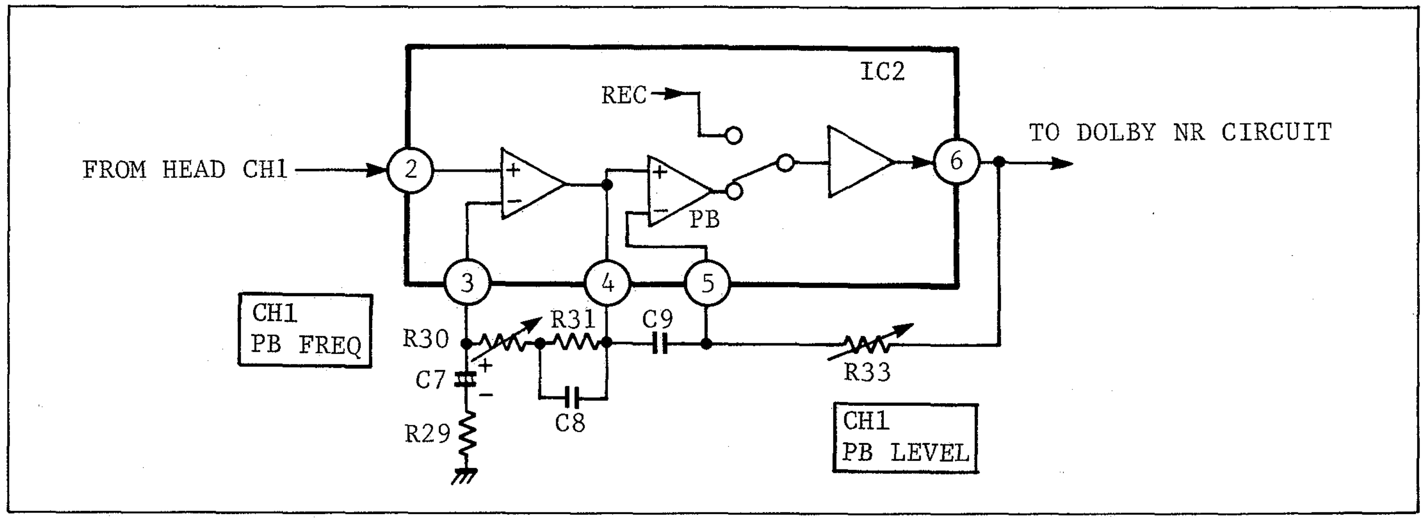

IC2
REC
FROM HEAD CH1
2
6
TO DOLBY NR CIRCUIT
PB
3
4
5
CH1
PB FREQ
R30
R31
C9
R33
C7
C8
R29
CH1
PB LEVEL

Figure 6-10. PB Amp & EQ.

DOLBY NR CIRCUIT (DECODER)

The Dolby NR decoding process is performed using the same IC and other components that were used in encoding (recording). The amplified and equalized signal is sent to Pin 5 of IC3 and the decoded signal comes from Pin 7 of IC3.

LINE AMP

The Dolby NR decoded signal is then supplied to the line amplifier inside IC2, and the amplified signal is sent to the Audio Meter. Similar to Record mode, the signal is also fed back (to the Dolby NR decoding process circuit) through the high pass filter consisting of C37, C44, C45 and R79, and supplied to pin 1 of IC3.

Detailed Description

PB AMP & EQ

The playback signal from the head is fed to Pin 2 of IC2 and applied to the next amplifier inside IC2. The output signal is also fed back to the inverted input of the amplifier through the CR network and the playback equalizer (Figure 6-10). The playback equalizer characteristics are shown in Figure 6-9.

DOLBY NR CIRCUIT (DECODER)

IC3 is also used for Dolby NR decoding (Playback). As can be seen in Figure 6-11, the decoding signal flow shows little difference from the encoding (recording) flow.
The signal amplified by IC2 is fed to the amplifier (A) between pin 5 and pin 6 of IC3. The amplified signal reenters IC3 through pin 2 after being filtered. The signal amplified by amplifier (B) is fed to the adder (E), but this time, the signal is not split or fed to the amplifier inside IC2. The Dolby NR decoded signal comes from pin 7 of IC3, and fed to IC2 through pin 8, where it is amplified, and exits from pin 9. The signal is then fed to the high pass filter and supplied to IC3 through pin 1. The signal is processed in the same way as in the encode mode, then fed to the other input of the adder (E). The Dolby NR decoded output from pin 9 of IC2 is also used for the recorder LINE OUT signal which is output from pin 9 of IC2. (after processing by Hi-Fi/ NORMAL SELECT Circuit)

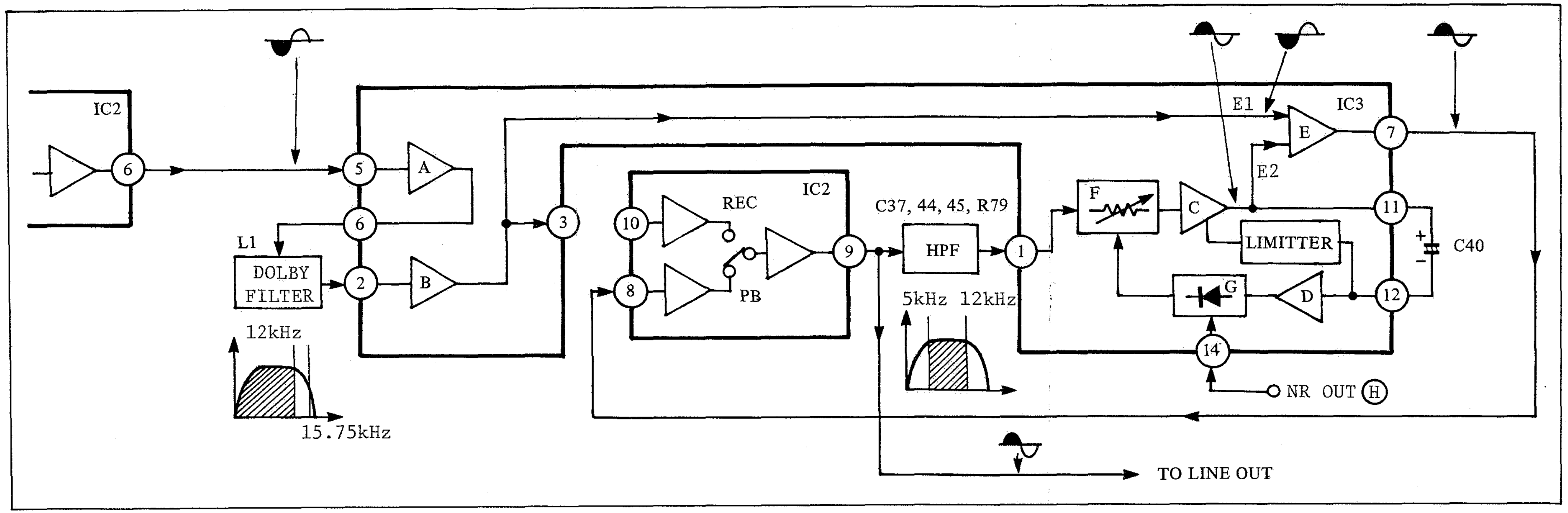


Figure 6-11. DOLBY NR System (PLAYBACK:Decode Mode)

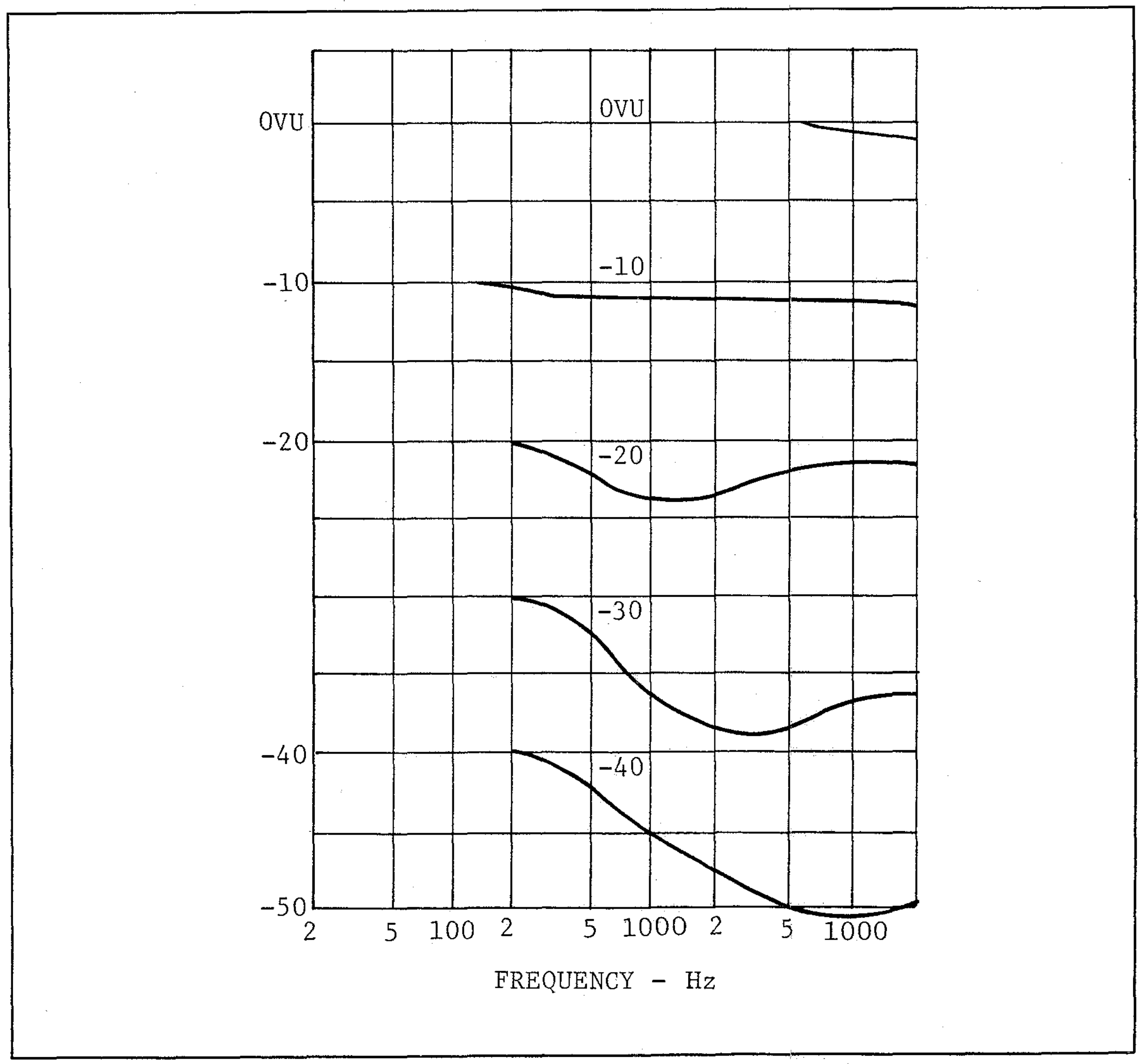
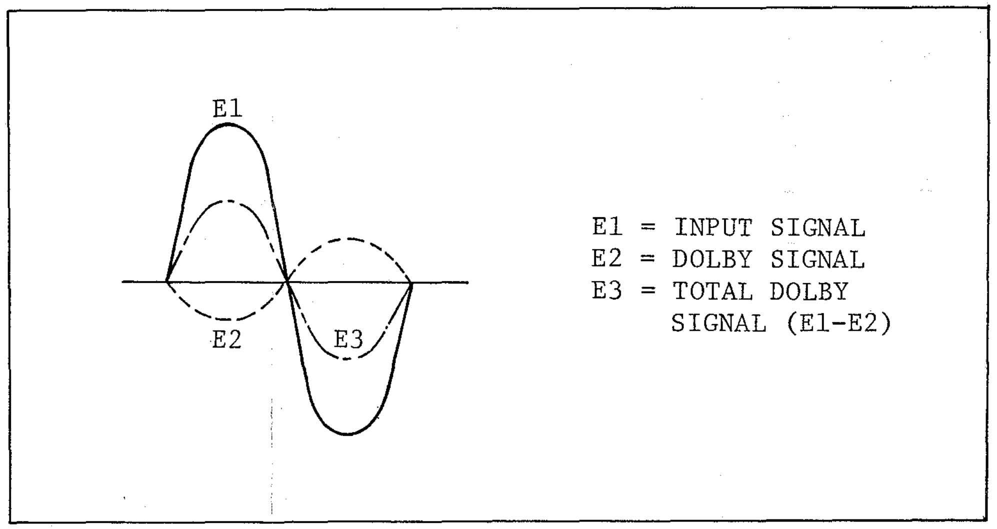


Figure 6-12. Frequency Response of DOLBY Decoder.



E1 = INPUT SIGNAL
E2 = DOLBY SIGNAL
E3 = TOTAL DOLBY SIGNAL (E1-E2)

Figure 6-13. Signal Function of DOLBY Decoder.

Switching Circuit

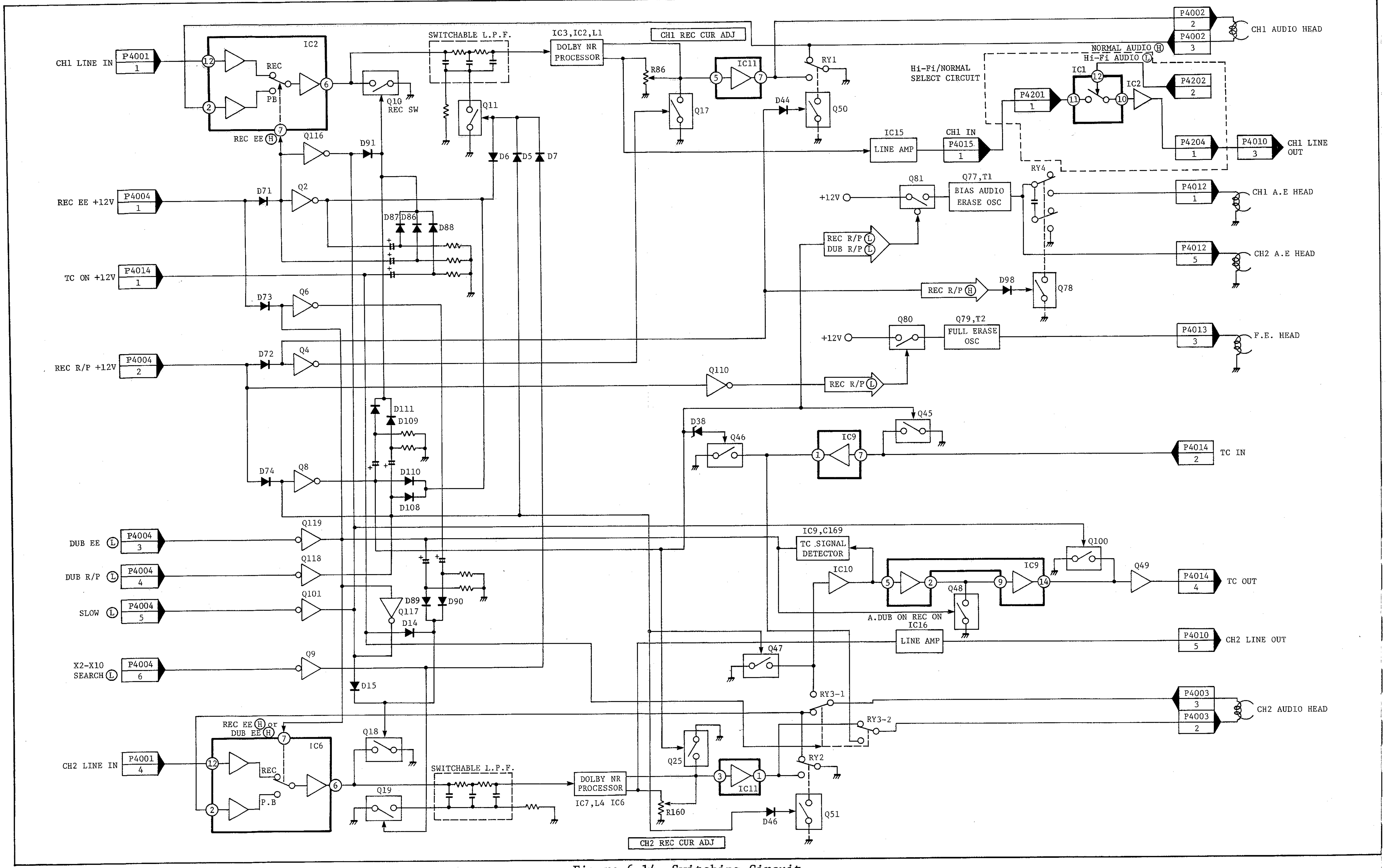

CH1 LINE IN
P4001 1
IC2
REC
PB
REC EE Ⓗ
SWITCHABLE L.P.F.
Q10 REC SW
Q11
IC3,IC2,L1
DOLBY NR PROCESSOR
CH1 REC CUR ADJ
R86
IC11
Q17
RY1
D44
Q50
P4002 2
P4002 3
CH1 AUDIO HEAD
NORMAL AUDIO Ⓗ
Hi-Fi AUDIO Ⓛ
Hi-Fi/NORMAL SELECT CIRCUIT
IC1
IC2
P4201 1
P4202 2
P4204 1
P4010 3
CH1 LINE OUT
IC15
LINE AMP
CH1 IN
P4015 1
Q116
D91
D6
D5
D7
REC EE +12V
P4004 1
D71
Q2
D87
D86
D88
RY4
Q81
Q77,T1
BIAS AUDIO ERASE OSC
+12V
P4012 1
CH1 A.E HEAD
REC R/P Ⓛ
DUB R/P Ⓛ
P4012 5
CH2 A.E HEAD
TC ON +12V
P4014 1
D73
Q6
REC R/P Ⓗ
D98
Q78
Q80
Q79,T2
FULL ERASE OSC
P4013 3
F.E. HEAD
REC R/P +12V
P4004 2
D72
Q4
Q110
REC R/P Ⓛ
D111
D109
D38
Q46
IC9
Q45
P4014 2
TC IN
D74
Q8
D110
D108
Q119
DUB EE Ⓛ
P4004 3
IC9,C169
TC SIGNAL DETECTOR
Q100
DUB R/P Ⓛ
P4004 4
Q118
IC10
IC9
Q48
Q49
P4014 4
TC OUT
SLOW Ⓛ
P4004 5
Q101
D89
D90
Q117
D14
A.DUB ON REC ON
IC16
LINE AMP
P4010 5
CH2 LINE OUT
X2-X10 SEARCH Ⓛ
P4004 6
Q9
Q47
D15
RY3-1
RY3-2
P4003 3
P4003 2
CH2 AUDIO HEAD
REC EE Ⓗ or DUB EE Ⓗ
IC6
Q18
CH2 LINE IN
P4001 4
REC
P.B
SWITCHABLE L.P.F.
Q19
DOLBY NR PROCESSOR
IC7,L4 IC6
Q25
IC11
RY2
R160
D46
Q51
CH2 REC CUR ADJ

Figure 6-14. Switching Circuit.

The audio section contains many switching circuits which consist of transistors or transistors and diodes. The switching circuits are controlled by digital signals from the System Control section to operate the various playback and Record mode switches, and to eliminate pop noise. The following descriptions will apply to both CH1 and CH2.

FUNCTIONAL DESCRIPTION OF THE SWITCHING CIRCUITS RECORDING AND PLAYBACK MODES

FULL RECORD MODE

If the REC and PLAY buttons are pushed, the unit goes into the full record mode. See Figure 6-14. The REC EE +12V signal stays high, and the REC R/P+12V signal also goes high.

Relays RY1 and RY2 go to the REC position, and the switches inside of IC2 and IC6 also go to the REC position.

Transistors Q17 and Q25 both are turned off by the REC R/P low output signal of inverters Q4 and Q8 respectively. The A.E and Bias oscillator is turned on by Q81 which goes on by the REC R/P low signal from Q8 inverter output.

Similarly, the F.E oscillator is turned on by the REC R/P low signal through Q110 and Q80.

AUDIO DUB AND SWITCHABLE LOW PASS FILTER

Audio Dub mode allows to record on one audio channel while the rest of the channel is in playback mode, only CH2 can be used for Audio Dub (After Recording). For example, the unit will be playing back video and CH1 audio, but will be recording on CH2 Audio.

If the A·DUB and PLAY buttons are pushed, the unit goes into the Audio Dub mode. See Figure 6-14. The DUB EE (L) signal stays low, and the DUB R/P (L) signal also goes low. The DUB EE (H) signal from Q119 is fed to IC6 and sets IC6 in REC mode, although IC2 stays in Playback mode. The DUB R/P (H) signal by the inverter Q118 is fed to Q51 then RY2 becomes in REC position.

The processed DUB R/P (L) signal through the inverters Q118 and Q8 are fed to Q81 then activates the Bias and A.E oscillator, and this low signal turns Q25 off for passing the recording signal to the recording amplifier, IC11.

In the Audio Dub mode of operation, a crosstalk problem can be occur because the CH1 and CH2 audio heads are close to each other. Magnetic coupling between the coils can cause high frequencies which are being recorded in CH2 to be present in the playback of CH2. To prevent this annoying sound, a Switchable Low Pass Filter is used in the CH1 playback path. The CH1 filter consists of R36, R37, R38 and C74, C75, C76, and is shown in Figure 6-15. Refer also to Figure 6-14 which shows the location of this filter (LPF Block) in the CH1 playback path.

This filter will route to ground all frequencies above 5kHz when the filter itself is grounded through Q11. Q11 itself is turned on by the DUB R/P (H) signal passing through D5.

(Audio Dub function is available when Remote Controller AG-A600 is Connected).

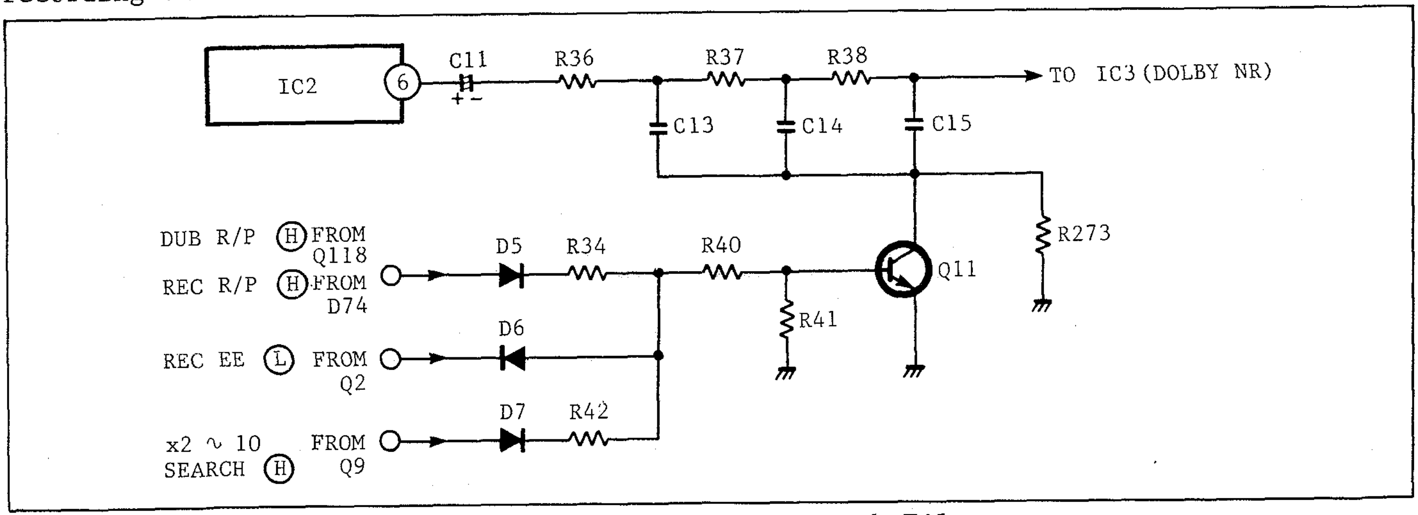


Figure 6-15. Switchable Low Path Filter.

PLAYBACK MODE

For playback, all record-playback switches go to the playback position. The REC EE (H) signal becomes low or can be called VV low (L) signal.

The muting switches Q10 (CH1) and Q18 (CH2) will momentary function. The recording paths out of the Dolby System are grounded for both channels to block any signal from getting to the recording amplifier IC11 (CH1, CH2). This action prevents any possible crosstalk between incoming and playback audio.

This is achieved in CH1 by Q4, Q17 and D72; for CH2 Q8, Q25 and D74.

The signal at P4004-(2) becomes low for playback, and high signal does not be supplied to Q8 because no audio dub command, therefore, both Q4 and Q8 can't be turned on. So the record-playback switches, Q17 and Q25, receive high signals and turn themselves on, and ground the audio record path each (Figure 6-16).

The audio circuit is also made for corresponding to this various playback mode. When X2 ∿ X10 search on both direction is selected, a low signal is supplied from P4004-(6) to Q9. After inversion, a

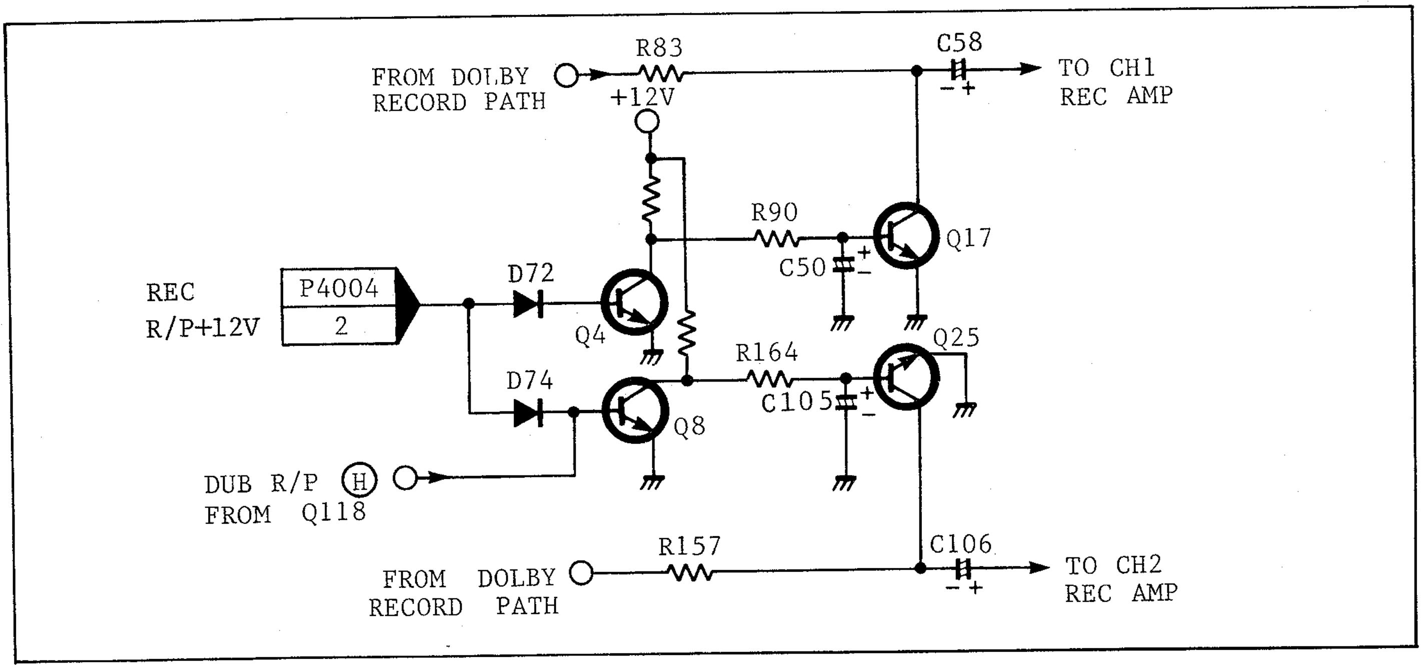

FROM DOLBY RECORD PATH
R83
+12V
C58
TO CH1 REC AMP
R90
C50
Q17
REC R/P+12V
P4004
2
D72
Q4
D74
R164
C105
Q25
Q8
DUB R/P (H) FROM Q118
R157
C106
FROM DOLBY RECORD PATH
TO CH2 REC AMP

Figure 6-16. Record-Playback Switches.

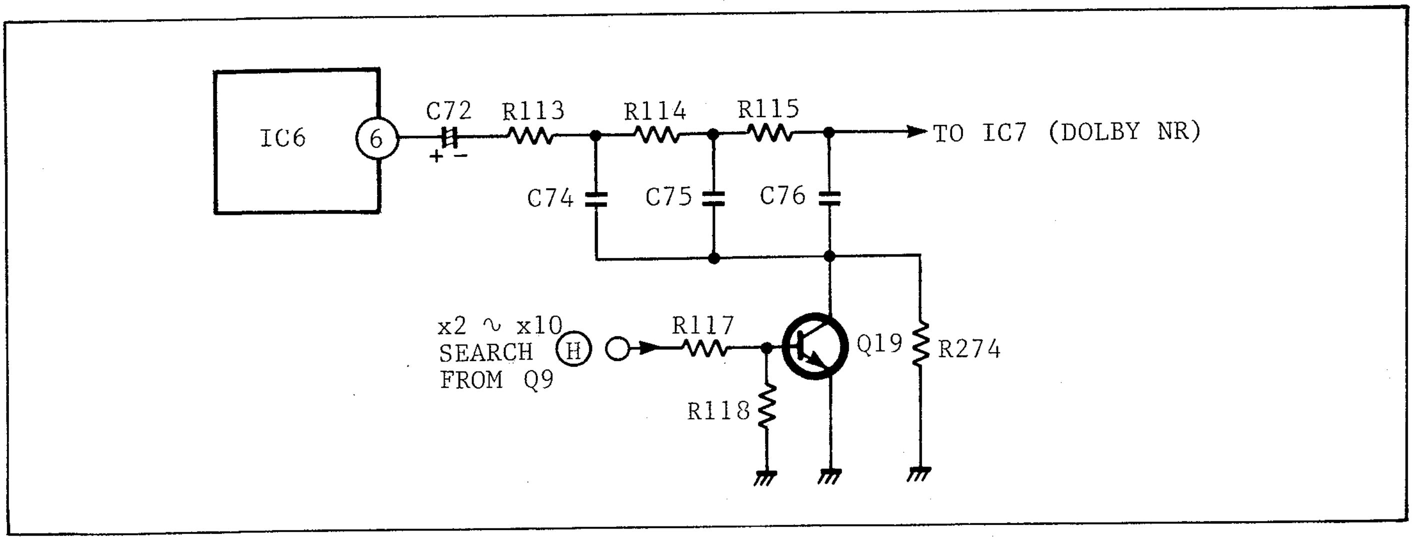

IC6
6
C72
R113
R114
R115
TO IC7 (DOLBY NR)
C74
C75
C76
x2 ∿ x10 SEARCH (H) FROM Q9
R117
Q19
R274
R118

Figure 6-17. Switchable Low Pass Filter in CH2 Playback Path.

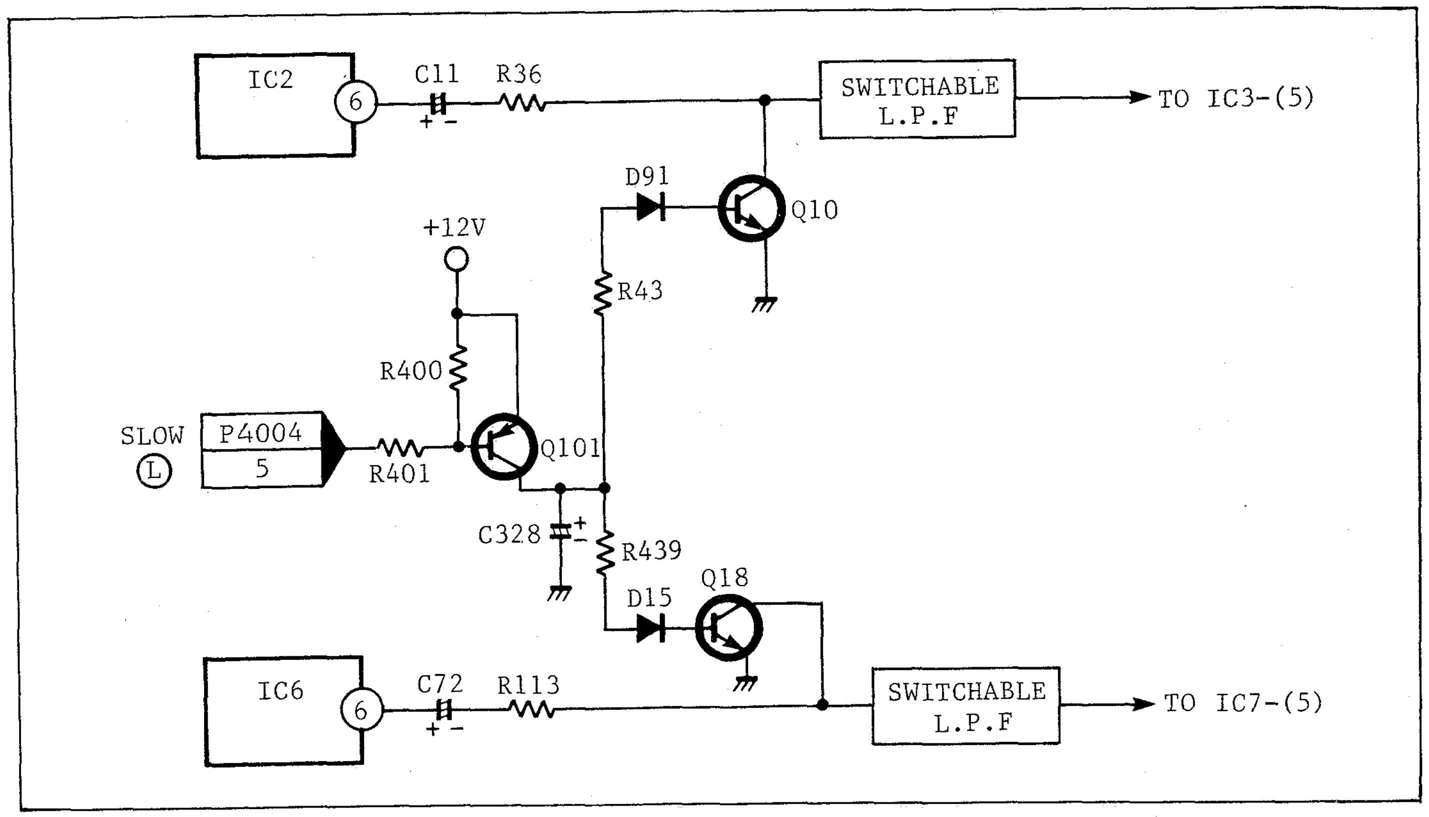

IC2
6
C11
R36
SWITCHABLE L.P.F
TO IC3-(5)
D91
Q10
+12V
R43
R400
SLOW
L
P4004
5
R401
Q101
C328
R439
D15
Q18
IC6
6
C72
R113
SWITCHABLE L.P.F
TO IC7-(5)

Figure 6-18. Slow Mode Muting.

high is sent through D7 to Q11 and Q19 directly. This turns Q11 and Q19 on so that the CH1 and CH2 high pass filters are switched to ground, eliminating frequency above 5kHz. This is done to avoid the annoying high level, high frequency audio playback encountered during Search. Refer to Figures 6-15 (CH1) and 6-17 (CH2).

Next if 1/2X ∿ 1/25X in forward direction and 1/2X in reverse direction playback is selected, a low signal is supplied from P4004-(5) to Q101. After inversion, a high signal is sent through D91 to Q10 and through D15 to Q18. (See Figure 6-18). This turns Q10 and Q18 on so that the CH1 and CH2 playback pathes are grounded, eliminating the annoying low frequency audio playback encountered during slow speed.

(Dub and Search functions are available when Remote Controller AG-A600 is connected.)

ELIMINATION OF POP NOISE

(1) Normal Record and Playback Mode

The circuit which eliminates pop noise is shown in Figure 6-19. The labelled points A, B and C go to the TV 8 pin Audio out, CH1 LINE OUT and CH2 LINE OUT. Point D and E are routed to the CH1 and CH2 H.P LEVEL terminals.

On the other hand, the audio circuit can eliminate the pop noise whenever the unit switches from EE to VV (or from VV to EE).

The REC EE +12V is fed to Q10 through D71 and D86. And the REC EE low which means VV (H) produced by Q2 is also fed to Q10 through D87.

The muting transistor Q10 is also functioned whenever the unit switches from TC (Time Code) OFF to ON.

For CH2, the similar muting circuit is realized by Q18 and D89 and D90. And Q18 is also turning on when the CH2 is selected not for audio but for time code.

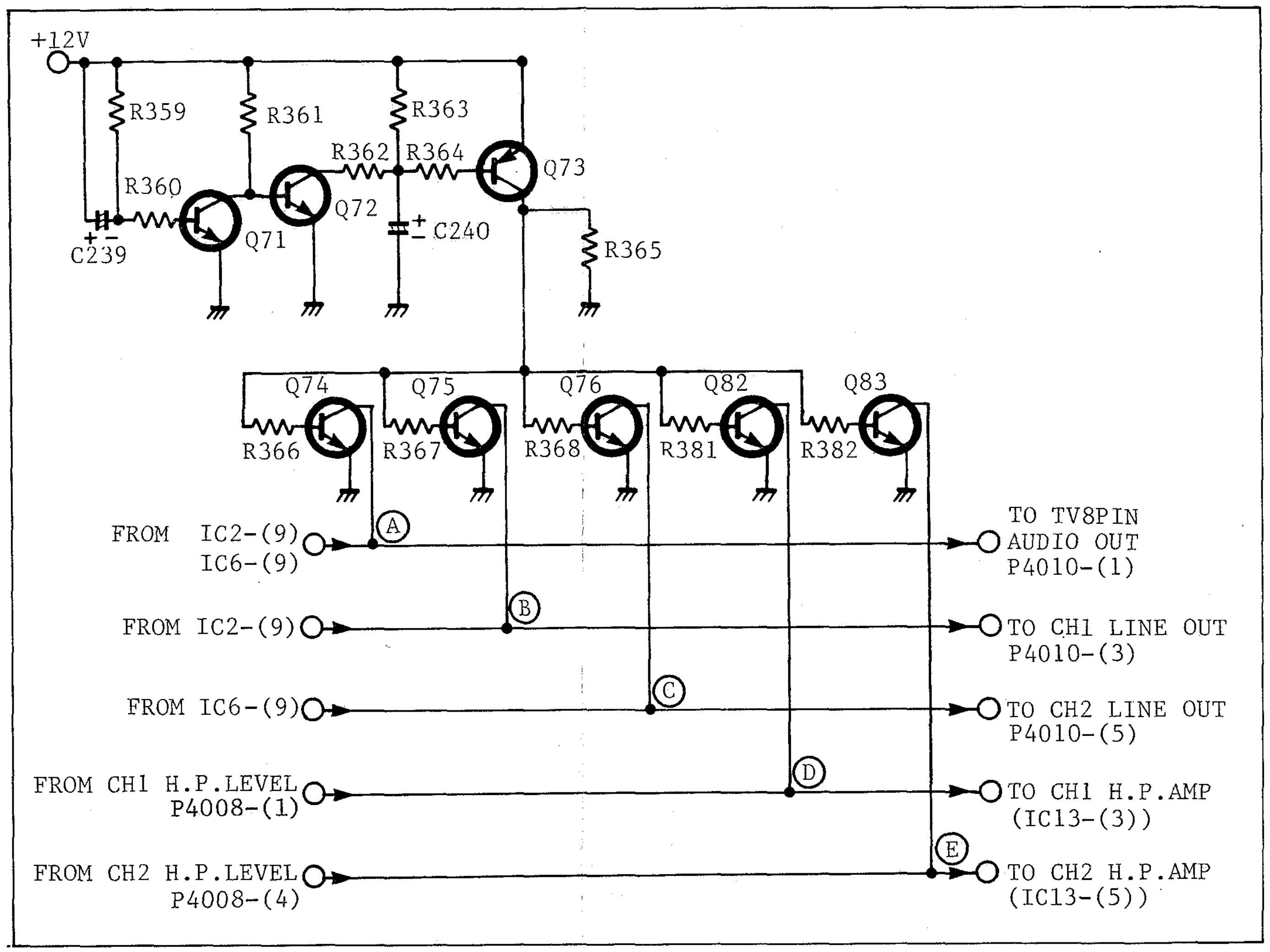

+12V
R359
R361
R363
R360
R362
R364
Q73
Q71
Q72
C239
C240
R365
Q74
Q75
Q76
Q82
Q83
R366
R367
R368
R381
R382
FROM IC2-(9)
IC6-(9)
A
TO TV8PIN AUDIO OUT P4010-(1)
FROM IC2-(9)
B
TO CH1 LINE OUT P4010-(3)
FROM IC6-(9)
C
TO CH2 LINE OUT P4010-(5)
FROM CH1 H.P.LEVEL P4008-(1)
D
TO CH1 H.P.AMP (IC13-(3))
FROM CH2 H.P.LEVEL P4008-(4)
E
TO CH2 H.P.AMP (IC13-(5))

Figure 6-19. Pop Noise Eliminator (1).

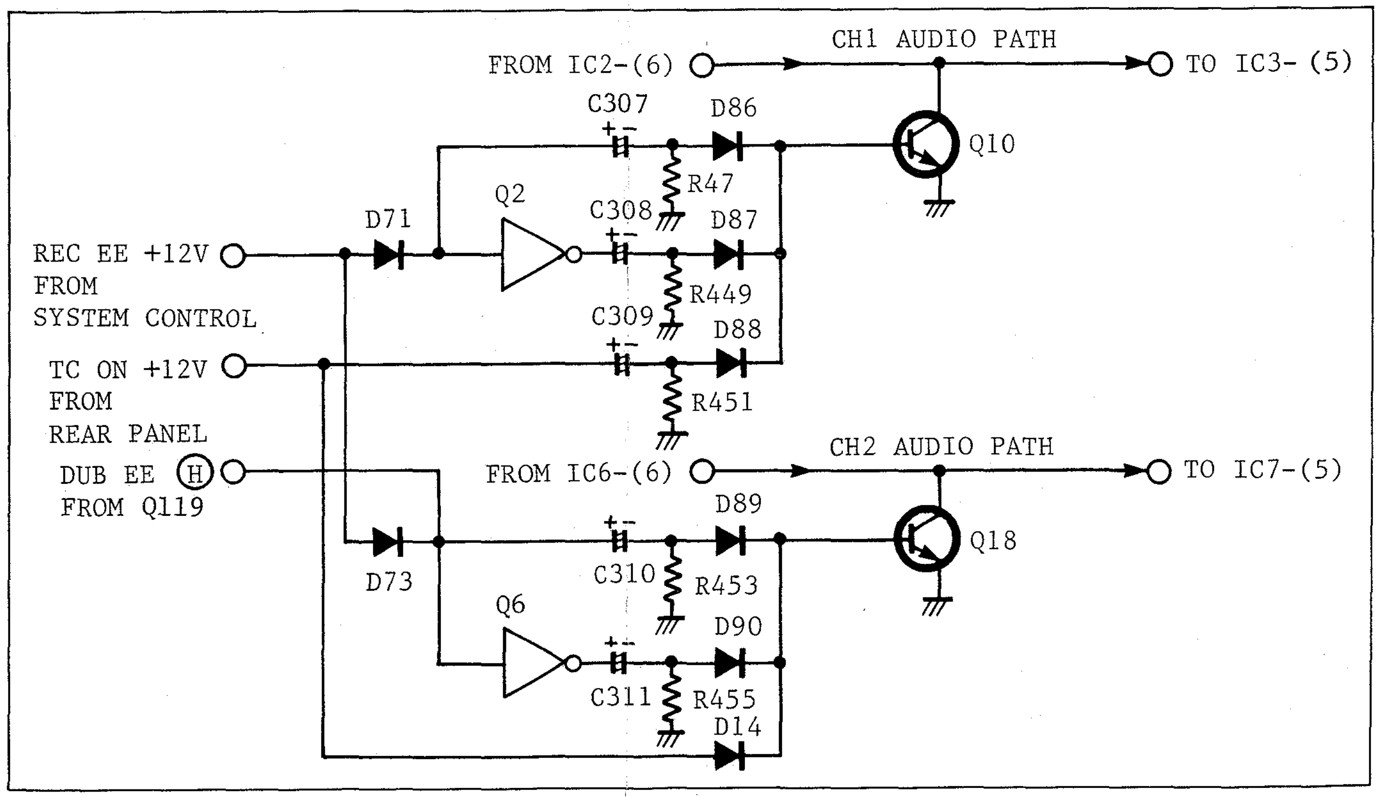

FROM IC2-(6)
CH1 AUDIO PATH
TO IC3-(5)
C307
D86
Q10
R47
Q2
C308
D87
D71
REC EE +12V FROM SYSTEM CONTROL
R449
C309
D88
TC ON +12V FROM REAR PANEL
R451
DUB EE H FROM Q119
FROM IC6-(6)
CH2 AUDIO PATH
TO IC7-(5)
D89
Q18
D73
C310
R453
Q6
D90
C311
R455
D14

Figure 6-20. Pop Noise Eliminator (2).

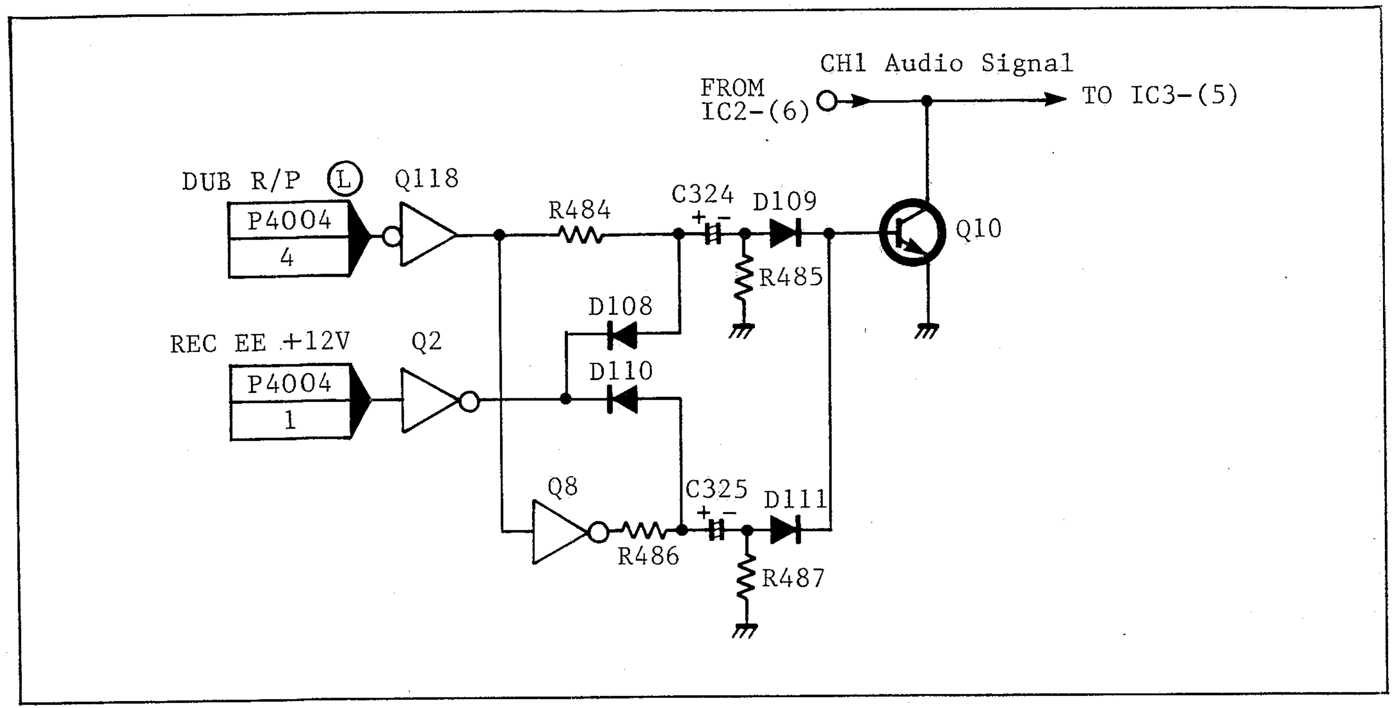

CH1 Audio Signal
FROM IC2-(6)
TO IC3-(5)
DUB R/P Ⓛ
P4004
4
Q118
R484
C324
D109
Q10
R485
D108
REC EE +12V
Q2
P4004
1
D110
Q8
C325
D111
R486
R487

Figure 6-21. Pop Noise Eliminator (3).

(2) During Audio Dub Mode

The pop noise elimination is also activated in Audio dub mode, For CH2, a high signal from Q119, DUB EE (H), is fed to Q18 through D89 and its inverted signal also fed to Q18 through D90. The muting transistor Q18 turns on when the transition from Audio Dub IN to OUT (or OUT to IN).
For CH1, a low signal DUB R/P (L), is inverted by Q118 and the produced high signal, DUB R/P (H) is fed to Q10 through D109, the signal is re-inverted by Q8 and also fed to Q10 through D111. The muting transistor Q10, turns on whenever the unit switches from Audio Dub IN to OUT (or OUT to IN), refer to Figure 6-21.
(Dub function is available when Remote Controller AG-A600 is Connected).

Time Code Circuit

The AG-6800 can record and playback a digital time code signal in the space usually occupied by Audio Channel 2. The CH2 audio head is utilized for this process.
The Time code signal is an 80 bit per frame bi-phase signal in which only the relative pulse width is important, not the pulse polarity.
It is recorded as a saturated magnetic transition without bias. A simplified block diagram is shown in Figure 6-22.

1. REC Amp

The bias difference at the inputs (pins 6, 7) of REC AMP in IC9 (Figure 6-23) is set at 66mV by R223, R222 and R219. The incoming T.C. signal is applied to pin 7. The transistor switch (Q45) grounds the non-inverted input of the amplifier to mute the incoming T.C. signal during playback.

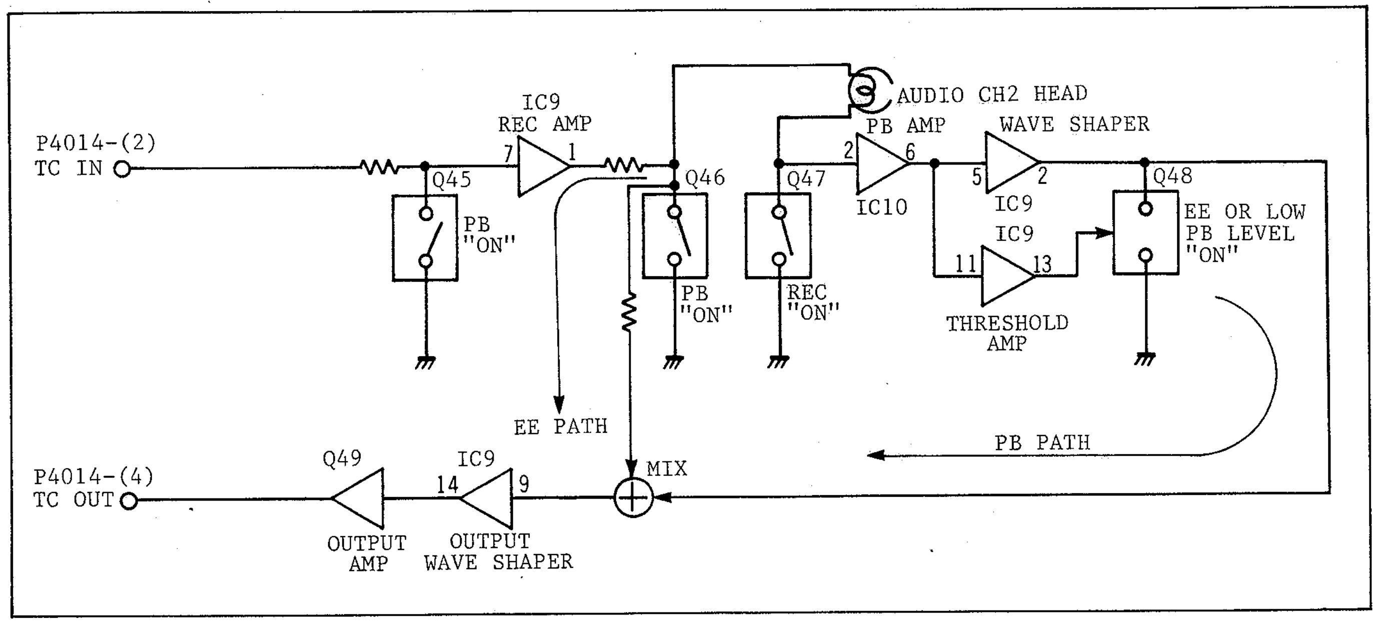

P4014-(2)
TC IN
IC9
REC AMP
7
1
Q45
PB "ON"
Q46
PB "ON"
AUDIO CH2 HEAD
PB AMP
2
6
Q47
IC10
REC "ON"
WAVE SHAPER
5
2
IC9
IC9
11
13
THRESHOLD AMP
Q48
EE OR LOW PB LEVEL "ON"
EE PATH
PB PATH
MIX
P4014-(4)
TC OUT
Q49
IC9
14
9
OUTPUT AMP
OUTPUT WAVE SHAPER

Figure 6-22. Time Code Circuit.

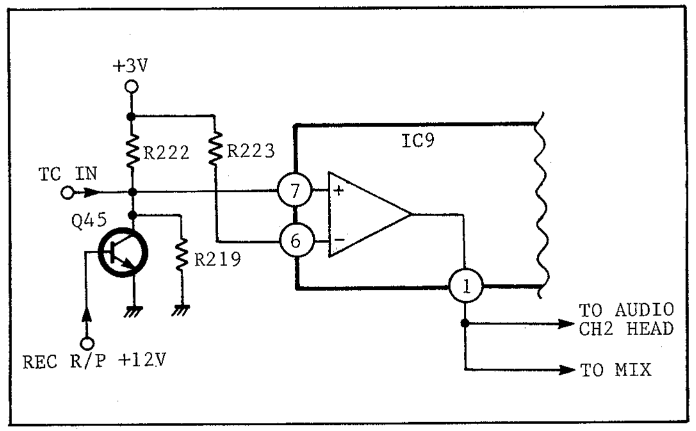

+3V
R222
R223
IC9
TC IN
7
6
+
−
Q45
R219
1
TO AUDIO CH2 HEAD
TO MIX
REC R/P +12V

Figure 6-23. Recording Amp.

2. P.B. Amp

OP AMP IC10 (Figure 6-24) provides the first stage of amplification for T.C. playback. C165 prevents high frequency oscillation.

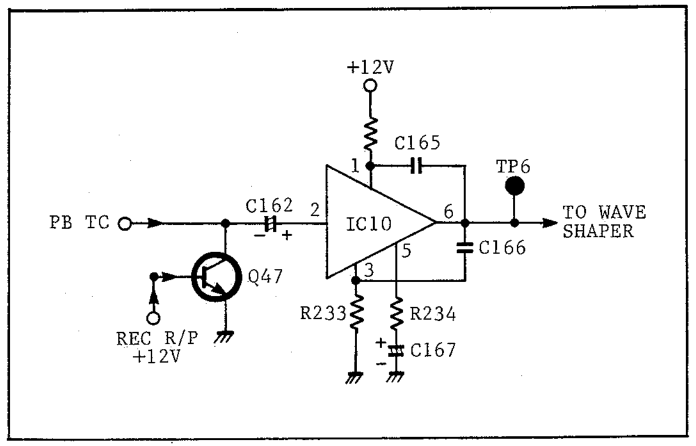

+12V
C165
TP6
PB TC
C162
2
1
IC10
6
TO WAVE SHAPER
5
C166
3
Q47
REC R/P +12V
R233
R234
C167

Figure 6-24. Playback Amp.

3. Threshold Amp

For playback T.C., a threshold is established. If the T.C. playback level is good, the T.C. signal is allowed to be passed. If the playback T.C. level is below the threshold, the output is blocked to prevent misreading by the time code reader.
R235, 236 set the threshold level at 8mVp-p (Figure 6-25).
When there is no T.C. playback, the threshold amp output from IC9 (13) is high, turning on Q48 and muting the T.C. playback. The same is true if the T.C. playback is below the threshold level.

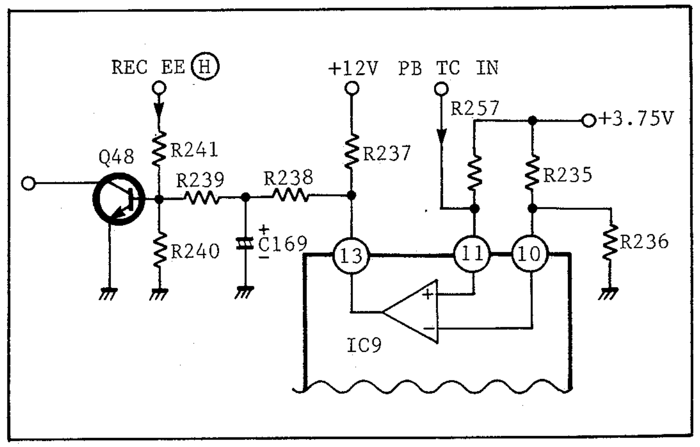

REC EE Ⓗ
+12V
PB TC IN
R257
+3.75V
Q48
R241
R237
R239
R238
R235
R240
C169
13
11
10
R236
IC9

Figure 6-25. Threshold Amp.

When T.C. playback exceeds the threshold, the signal appears at the output, pin 13, and the "OFF" portions of the signal keep C169 almost fully discharged by the fast discharge path through R238. For this condition, Q48 stays off, passing the T.C. signal.

4. PB Wave Shaper and Output Wave Shaper

The PB wave shaper is inside IC9. The input is not biased in order to cut the signal at center. The output is sent down the same path used by the EE signal and fed to the Output wave shaper. The input of this Output wave shaper is biased at 1V.
The output is then amplified by the output amp, Q49 (Figure 6-26), and sent to connector P4014-Pin 4 for use by an external T.C. reader device. The output level of the time code is set at 2.4Vp-p. To prevent the time code from being misread in the Slow playback modes (1/2X ∿ 1/25X: Forward, 1/2X: Reverse), Q100 grounds the time code output with the SLOW high signal from P4004 Pin 5 through Q101.
(Slow function is available when Remote Controller AG-A600 is connected).

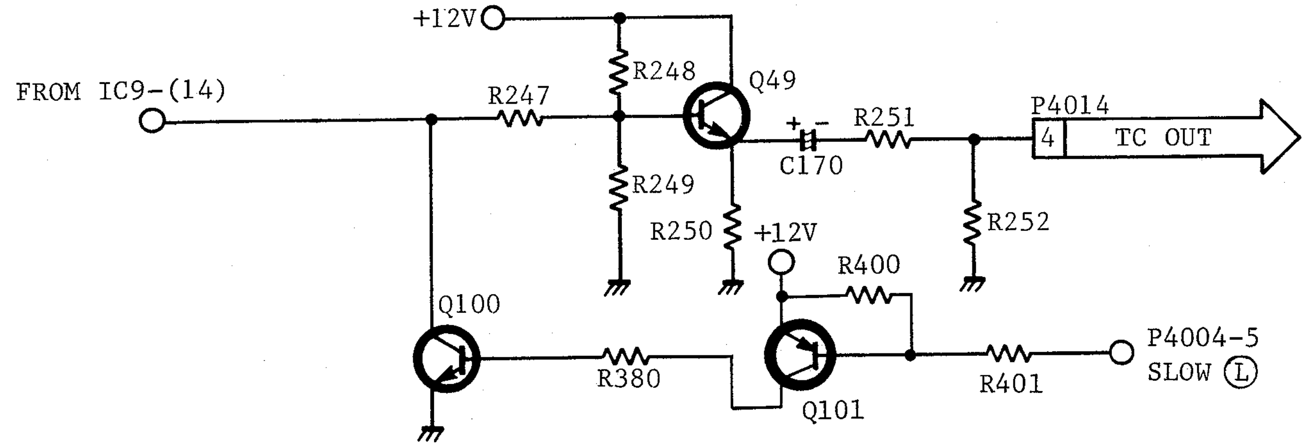


Figure 6-26. PB Wave Shaper and Output Wave Shaper.

Hi-Fi AUDIO RECORDING PROCESS

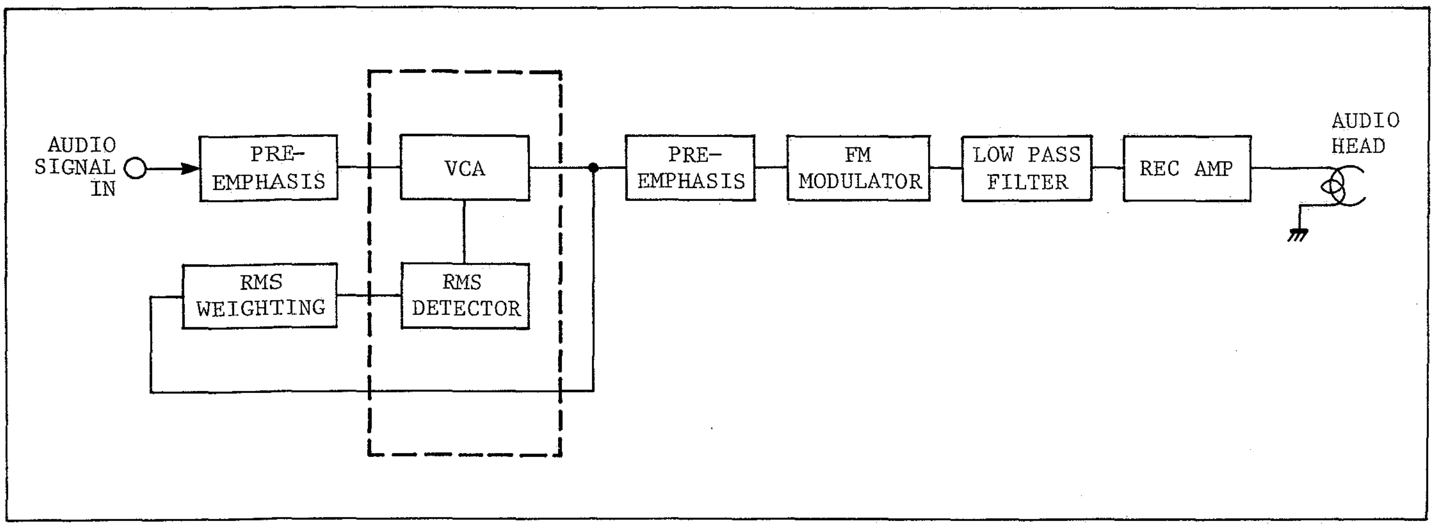


Figure 7-1. Hi-Fi Audio Recording Process (one channel shown).

General Description

A simplified block diagram for the Hi-Fi audio recording process is shown in Figure 7-1.

The VCA and RMS Detector blocks (shown enclosed in Figure 7-1) perform the amplitude compression function, while the Pre-Emphasis and Weighting blocks provide the frequency shaping characteristic. The remaining blocks perform the FM processing for the new modulation system, and the other recording mode operations.

PRE-EMPHASIS

The pre-emphasis circuits boost the level of the high frequency portions of the signal. This is a normally applied operation in FM audio systems and is used to improve signal to noise ratio of the high frequencies during playback. Upon playback, these signals will be de-emphasized, which will restore the original characteristics of the signal.

VCA (Voltage-Controlled Amplifier/ Attenuator)

The VCA varies the degree of amplification logarithmically in response to the control voltage from the RMS Detector. This results in compression of the input signal dynamic range.

RMS DETECTOR (ROOT MEAN SQUARE)

This circuitry generates a DC voltage which controls the degree of amplification in the VCA in proportion to the level of the input signal. It does this by detecting the root mean square (RMS) value of the signal at detector input and then converting it to a DC voltage in proportion to the logarithm of the detected level. The use of an RMS type detector makes the detected voltage independent of waveform changes due to phase shift.

RMS WEIGHTING

To prevent saturation levels at the pre-emphasized high frequencies, an RMS Weighting circuit is used ahead of the RMS Detector. The Weighting circuit increases the level of the high frequencies in the signal to the RMS Detector. The net effect is an increase in detection voltage to the VCA, and a decrease in the VCA gain at these frequencies. As a result, linearity is enhanced in the high frequency range.

FM MODULATOR

The pre-emphasized and compressed signal is then sent to a VCA (voltage controlled oscillator) inside of the FM Modulator in IC4306 (IC4314 for CH2). The modulated FM audio signal is adjusted for a frequency deviation of about ±150kHz around the 1.3MHz carrier frequency of CH1 (left channel), and the same deviation around the 1.7MHz carrier of CH2 (right channel).

LOW PASS FILTER

The FM-modulated audio signal is then sent to a low pass filter where frequencies above 2.5MHz are cut off.

REC AMP CIRCUIT

The low pass filtered FM audio signal is then level adjusted by the REC current adjust resistor. The left channel (CH1) audio signal is then mixed together with the Right channel audio signal.
Finally the mixed FM audio signal is amplified by the REC AMP circuit and then recorded onto tape via the rotary audio heads.

Detailed Description

Since similar circuits are used in each channel, the following description will apply to either channel but only diagrams for channel 1 components will be shown.

PRE-EMPHASIS I (For Hi-Fi Audio)

The pre-emphasis I circuit emphasizes the high frequencies according to the characteristic of Figure 7-2, and then sends the emphasized signal to the VCA circuit. This circuit is used to provide the Hi-Fi extended frequency range of 20Hz to 20kHz as shown in Figure 7-2. Referring to the circuit diagram (Figure 7-3), the audio input signal enters through P4309, Pin 6 to the base of Q4348. The output of Q4348 then passes through ON transistor Q4304 to the pre-emphasis circuit composed of Q4308, C4357, R4465, and R4467. The transistor switch Q4304 is turned on during the recording mode by the high signal of EE+12V via Q4326 and Q4324.

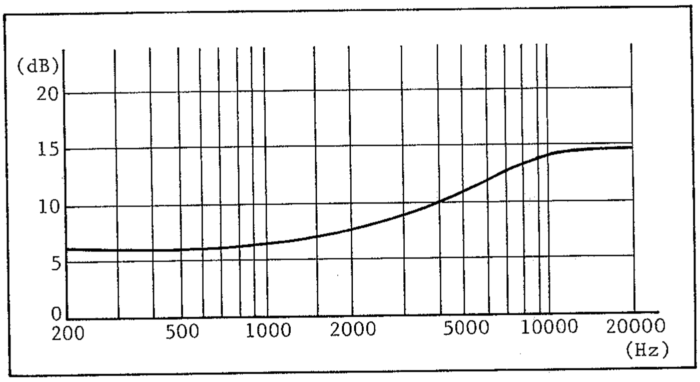


Figure 7-2. Pre-Emphasis I Characteristic.

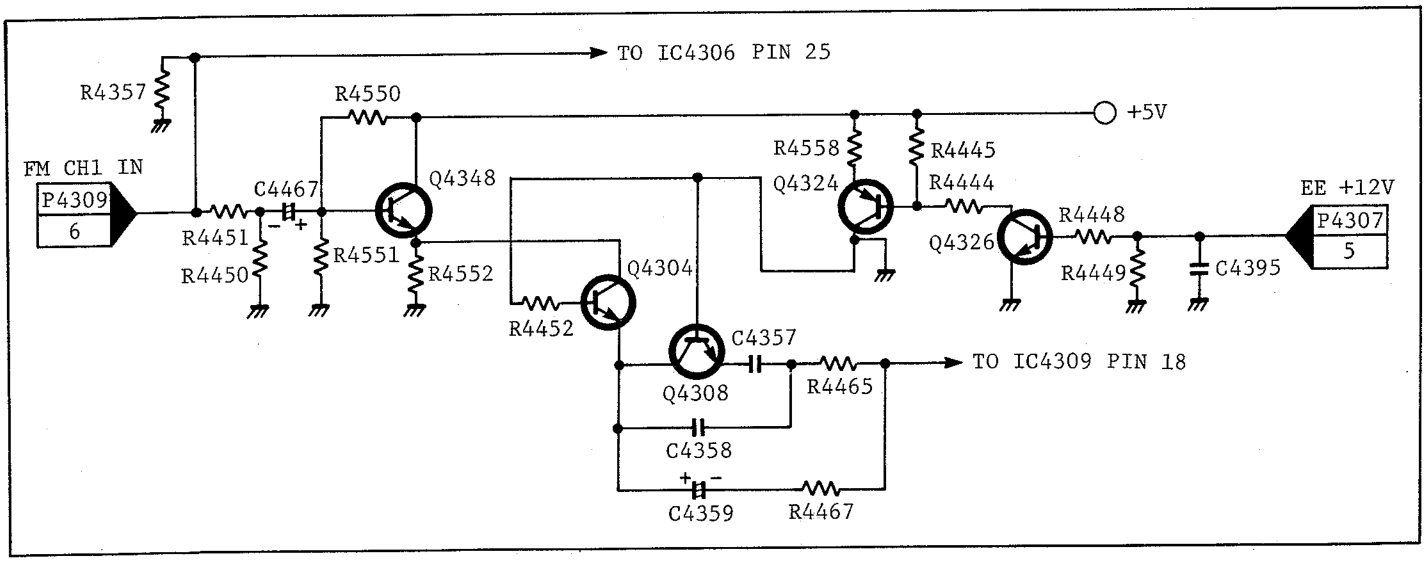

TO IC4306 PIN 25
R4357
R4550
+5V
FM CH1 IN
P4309
6
C4467
Q4348
R4558
R4445
Q4324
R4444
EE +12V
P4307
5
R4448
Q4326
R4451
R4450
R4551
R4552
Q4304
R4449
C4395
R4452
C4357
TO IC4309 PIN 18
Q4308
R4465
C4358
C4359
R4467

Figure 7-3. Pre-Emphasis I Circuit.

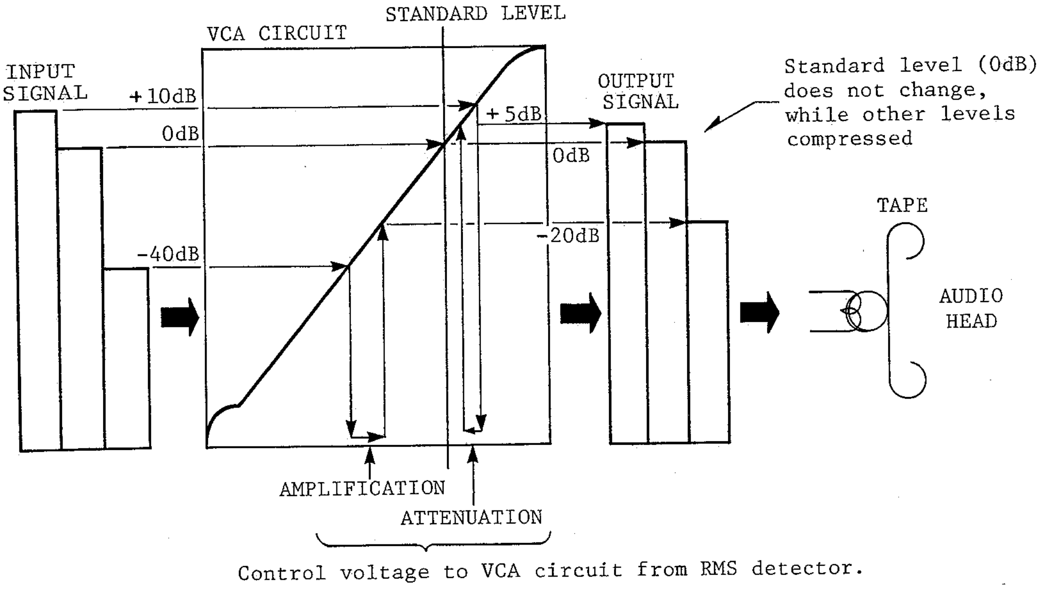

STANDARD LEVEL
VCA CIRCUIT
INPUT SIGNAL
+10dB
0dB
-40dB
+5dB
0dB
-20dB
OUTPUT SIGNAL
Standard level (0dB) does not change, while other levels compressed
TAPE
AUDIO HEAD
AMPLIFICATION
ATTENUATION
Control voltage to VCA circuit from RMS detector.

Figure 7-4. Record Input.Output Characteristic of VCA Circuit.

VCA (Voltage Controlled Amplifier/ Attenuator)

The VCA circuit performs logarithmic compression low distortion over a wide range of input signal levels (80 dB). This circuit is an amplifier whose gain changes logarithmically in accordance with the DC control voltage from the RMS detector.

In the recording mode the VCA circuit serves as an attenuator when the input level is higher than the standard level (0 dB), and as an amplifier when the input level is lower than the standard level.

This action of the VCA is illustrated for three input levels in Figure 7-4, and shows how the output signal level range is compressed.

RMS WEIGHTING

The compressed VCA output signal is fed back to an RMS weighting circuit before it is used by the RMS Detector to develop the DC control voltage for the VCA. The weighting circuit characteristic emphasizes the medium to high frequencies which results in a proportionate increase in the developed RMS Detector DC voltage, and a corresponding VCA gain decrease in this frequency range. (The weighting operation is necessary to prevent tape saturation as explained in the general description of the recording process.)

The VCA output exits from IC4309, Pin 15 and is sent through ON transistor Q4307 to the weighting circuit R4462, R4463, and C4352 (Figure 7-5).

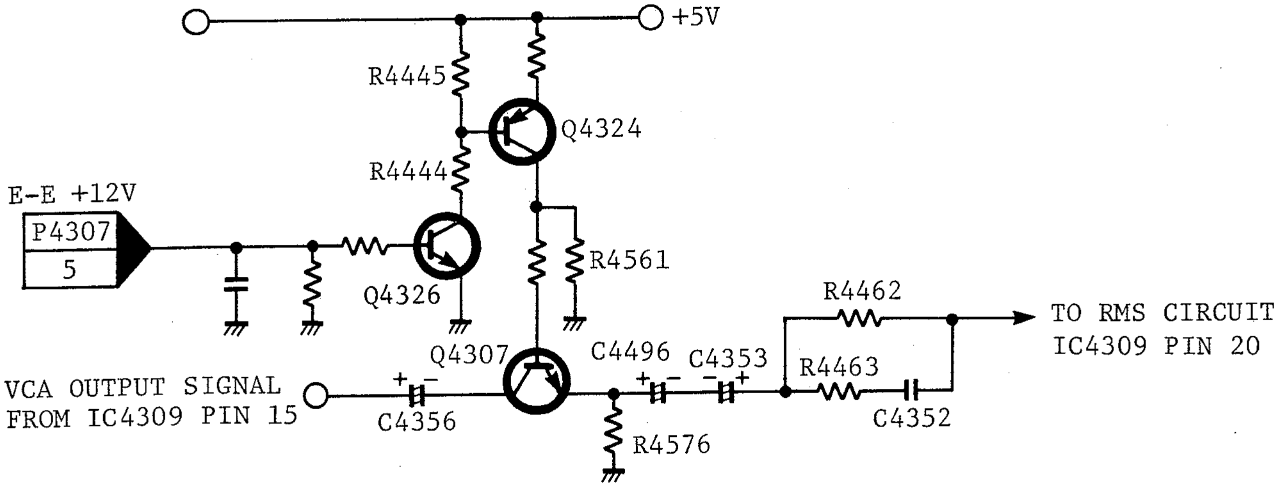

+5V
R4445
Q4324
R4444
E-E +12V
P4307
5
Q4326
R4561
R4462
TO RMS CIRCUIT IC4309 PIN 20
Q4307
C4496
C4353
R4463
VCA OUTPUT SIGNAL FROM IC4309 PIN 15
C4356
R4576
C4352

Figure 7-5. RMS Weighting Circuit.

The output of the weighting circuit is then sent to the RMS Detector inside IC4309.
Transistor Q4307 is controlled by the high EE+12V signal using the same circuit of Q4326 and Q4324 as is used for the pre-emphasis I circuit of Figure 7-3.

RMS DETECTOR and VCA CONTROL CHARACTERISTICS

After the feedback signal from the VCA output is properly weighted, the RMS value of the signal is detected by the RMS Detector and the developed DC voltage applied to the VCA.
Figure 7-6 shows the action of this feedback circuit for an example of -10 dB output from the VCA, and is best explained with reference to the RMS Detector and VCA gain characteristics given in Figure 7-7 and 7-8. Figure 7-7 shows that -10 dB input level at the RMS Detector results in -60mV DC control voltage to the VCA. The VCA gain characteristic of Figure 7-8 then shows that -60mV control voltage corresponds to 10 dB of VCA gain and results in the VCA input/output levels of -20 dB/-10 dB.

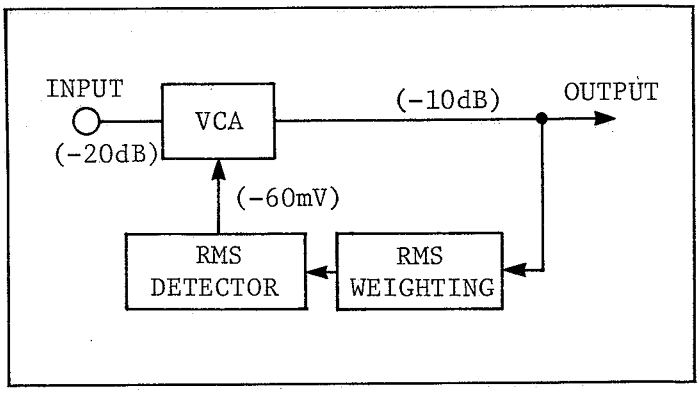


Figure 7-6. VCA Recording Signal Compression Process.

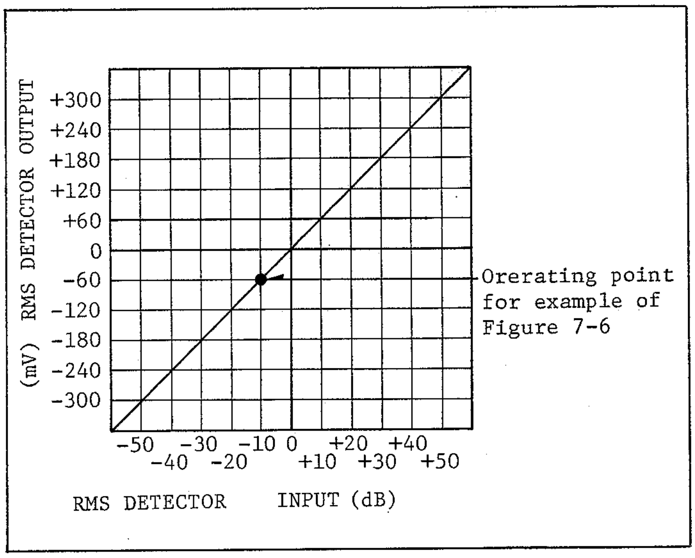


Figure 7-7. RMS Detector Characteristic.

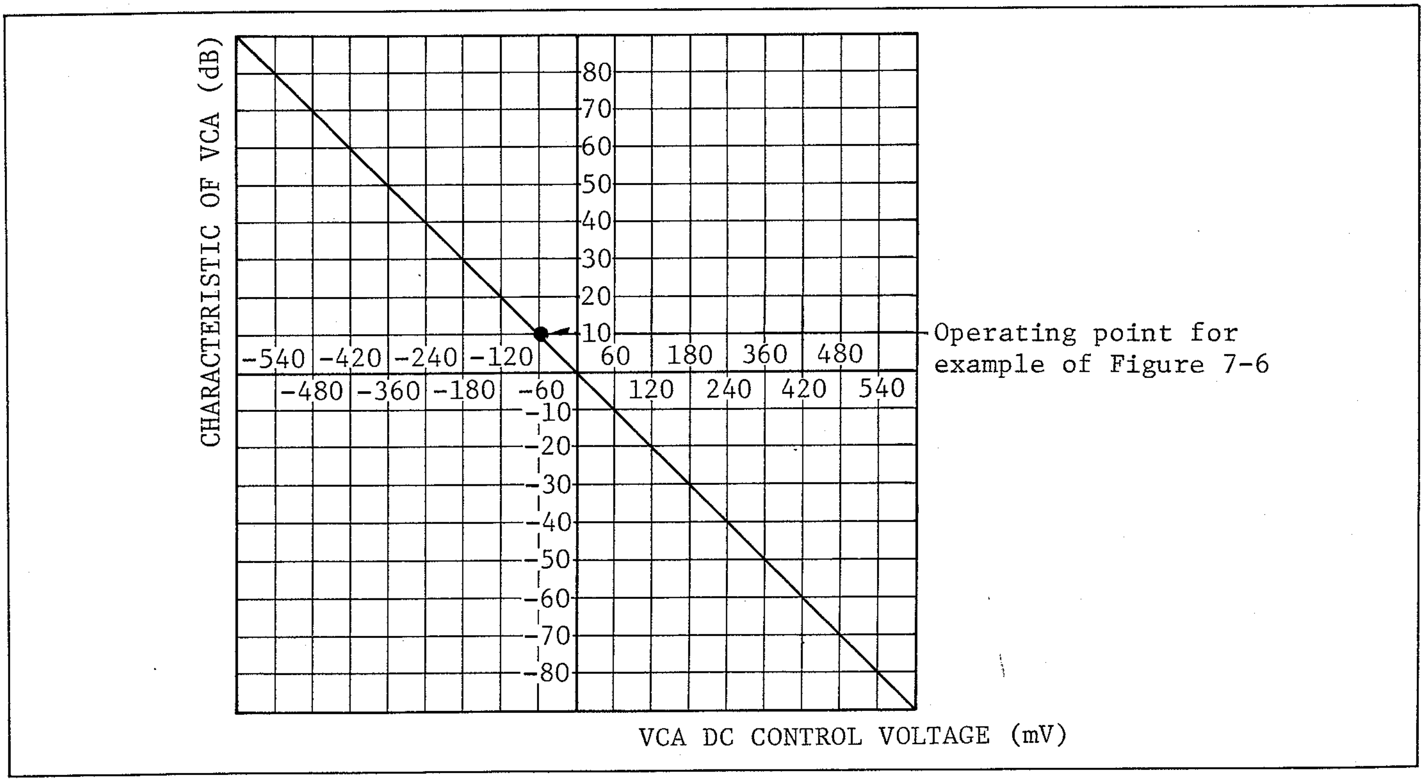


Figure 7-8. VCA Circuit.

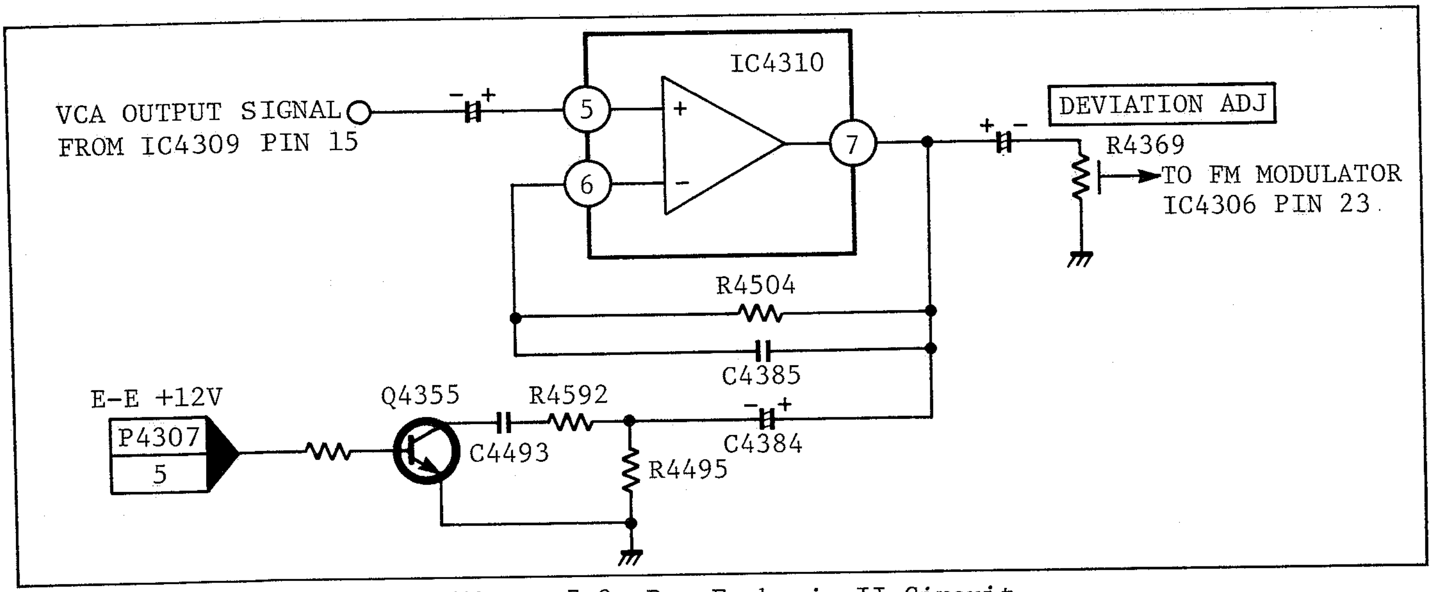

VCA OUTPUT SIGNAL
FROM IC4309 PIN 15
IC4310
5
6
7
+
-
DEVIATION ADJ
R4369
TO FM MODULATOR
IC4306 PIN 23
R4504
C4385
E-E +12V
P4307
5
Q4355
R4592
C4493
C4384
R4495

Figure 7-9. Pre-Emphasis II Circuit.

PRE-EMPHASIS II (FOR NOISE REDUCTION)

The VCA output is then further processed to a second pre-emphasis circuit to improve the signal-to-noise ratio of high frequency during playback.
Figure 7-9 shows the pre-emphasis II circuit which is an active RC filter using an operational amplifier inside IC4310 and the external components R4504, C4385, R4495, R4592, and C4493. During record mode, EE+12V high signal turns on Q4355 and effectively connects C4493 and R4592 across R4495 which enables the filter circuit.
The emphasized signal is then sent to R4369 for adjustment of FM signal deviation, and then fed to the FM Modulator in IC4306 (Pin 23).

FM MODULATOR

Referring to figure 7-10, the audio signal is FM modulated by the VCO (Voltage Controlled Oscillator) inside of IC4306.
The 1.3MHz carrier FM signal of channel 1 is determined by R4366 and R4365.
(The 1.7MHz Carrier FM signal of channel 2 is determined by R4522 and R4521.)
Deviation range is about ±150kHz.

The record/playback switch inside IC4306 is switched to the record position by a high signal to pin 24 of IC4306. The high signal results from the E-E+12 Volt signal operating through Q4324 and Q4326 (This is the same switching circuit as used in the Pre-Emphasis I and Weighting circuits shown in Figures 7-3 and 7-5.)

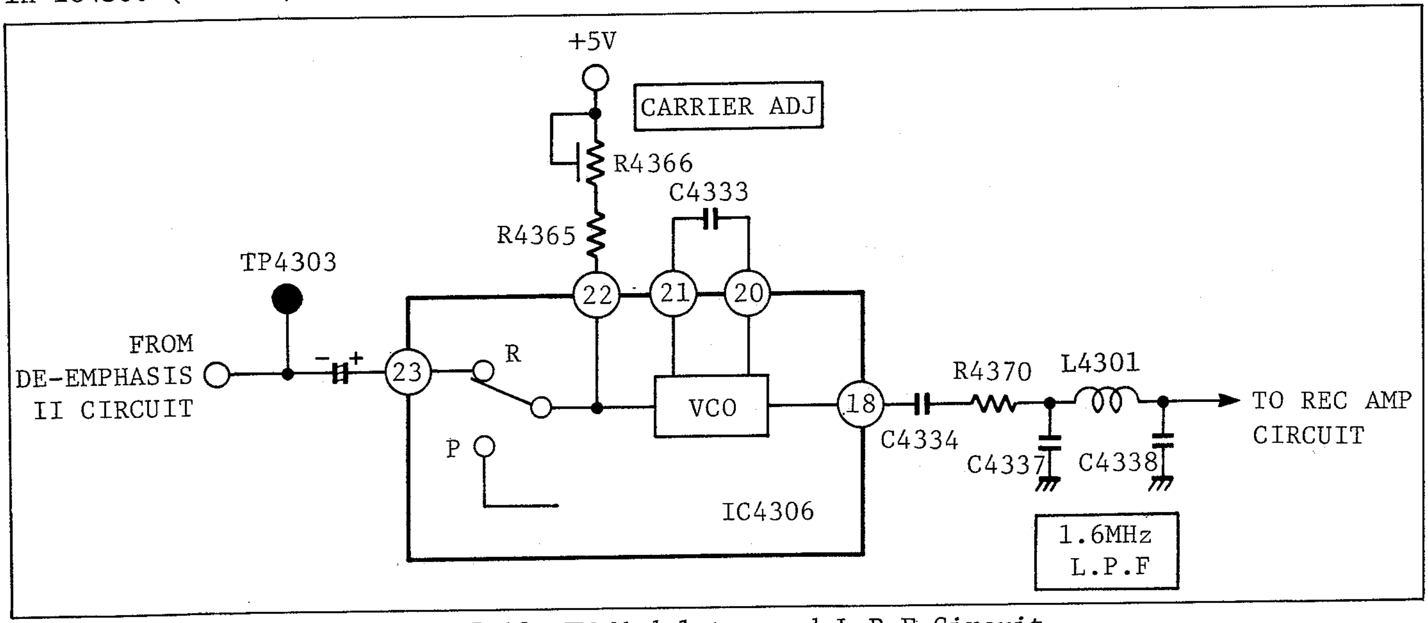

+5V
CARRIER ADJ
R4366
C4333
R4365
TP4303
22
21
20
FROM
DE-EMPHASIS
II CIRCUIT
23
R
P
VCO
18
IC4306
R4370
L4301
C4334
C4337
C4338
TO REC AMP
CIRCUIT
1.6MHz
L.P.F

Figure 7-10. FM Modulator and L.P.F Circuit.

LOW PASS FILTER

The modulated FM signal from IC4306 Pin 18 is then fed to the low pass filter C4337, L4310, and C4338 which removes the second, third, and higher harmonics of the modulation process.

REC AMP CIRCUIT

The FM audio signal is then adjusted by the REC CUR ADJ R4371 (Figure 7-11), and fed to the REC AMP circuit composed of Q4329, Q4330, Q4331, Q4332 and Q4334. At this point, the processed right channel audio signal is mixed with the left channel signal at the input to the recording amplifier. (A single common recording amplifier is possible because the left and right channel audio signals are modulated on the different carrier frequencies of 1.3MHz and 1.7MHz. After common amplification, the signals are recorded onto tape via P4301, Pin 1 (Pin 6 for CH2) and the rotary audio heads.)

E-E MODE

The audio signal is also applied to a monitor amplifies at IC4306 Pin 25 (Figure 7-12).
During record mode, the REC H signal at Pin 24 operates the Record/Playback/Mute switch to the REC position and the record audio signal appears at IC4306, Pin 1. This point connects with the Line and Headphone amplifiers to provide audio monitoring in the recording mode.

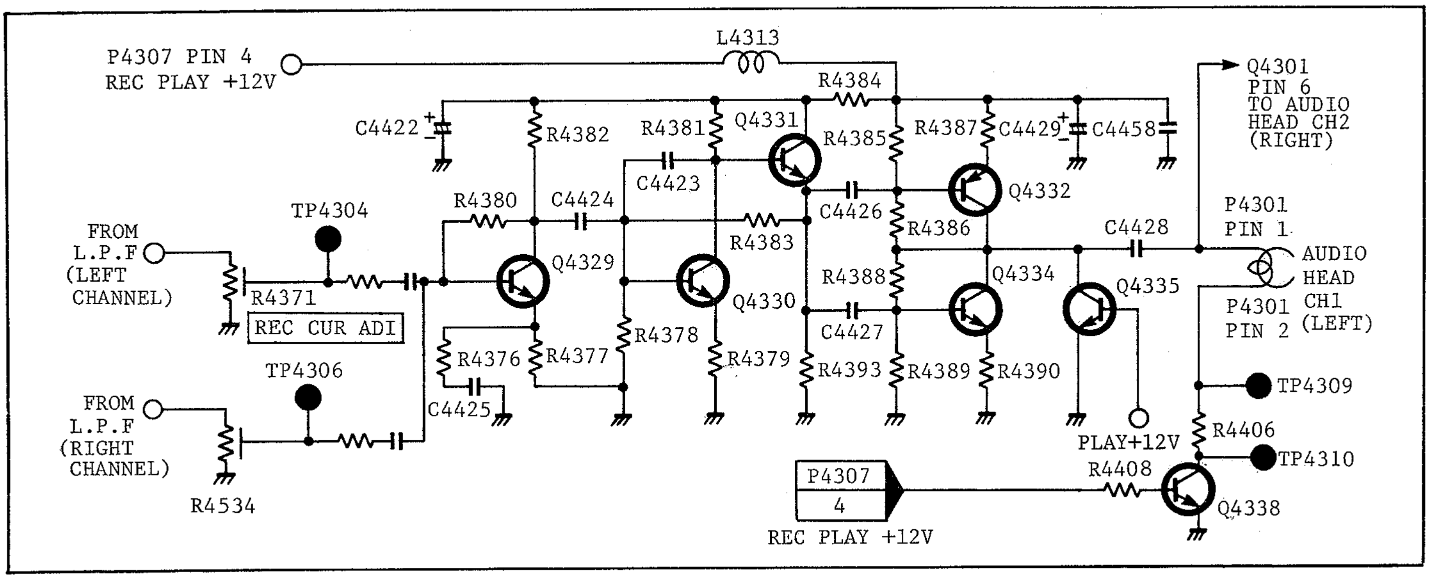

P4307 PIN 4
REC PLAY +12V
L4313
R4384
Q4301
PIN 6
TO AUDIO
HEAD CH2
(RIGHT)
C4422
R4382
R4381
Q4331
R4385
R4387
C4429
C4458
C4423
Q4332
TP4304
R4380
C4424
R4383
C4426
R4386
C4428
P4301
PIN 1
FROM
L.P.F
(LEFT
CHANNEL)
Q4329
R4388
Q4334
Q4335
AUDIO
HEAD
CH1
(LEFT)
R4371
REC CUR ADJ
Q4330
C4427
P4301
PIN 2
R4378
R4376
R4377
R4379
R4393
R4389
R4390
TP4306
C4425
TP4309
FROM
L.P.F
(RIGHT
CHANNEL)
PLAY+12V
R4406
TP4310
R4534
P4307
4
R4408
Q4338
REC PLAY +12V

Figure 7-11. REC Amp Circuit.

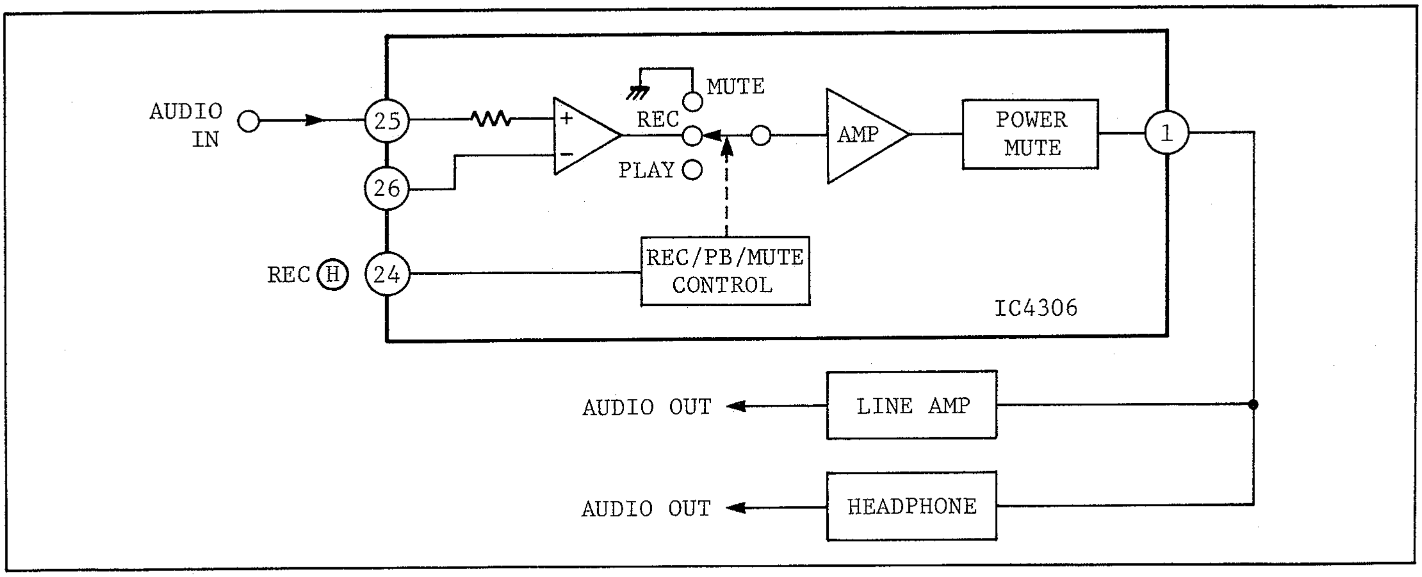

AUDIO
IN
25
26
24
REC Ⓗ
+
−
MUTE
REC
PLAY
AMP
POWER
MUTE
1
REC/PB/MUTE
CONTROL
IC4306
AUDIO OUT
LINE AMP
AUDIO OUT
HEADPHONE

Figure 7-12. Audio Monitor Circuit.

Hi-Fi AUDIO PLAYBACK PROCESS

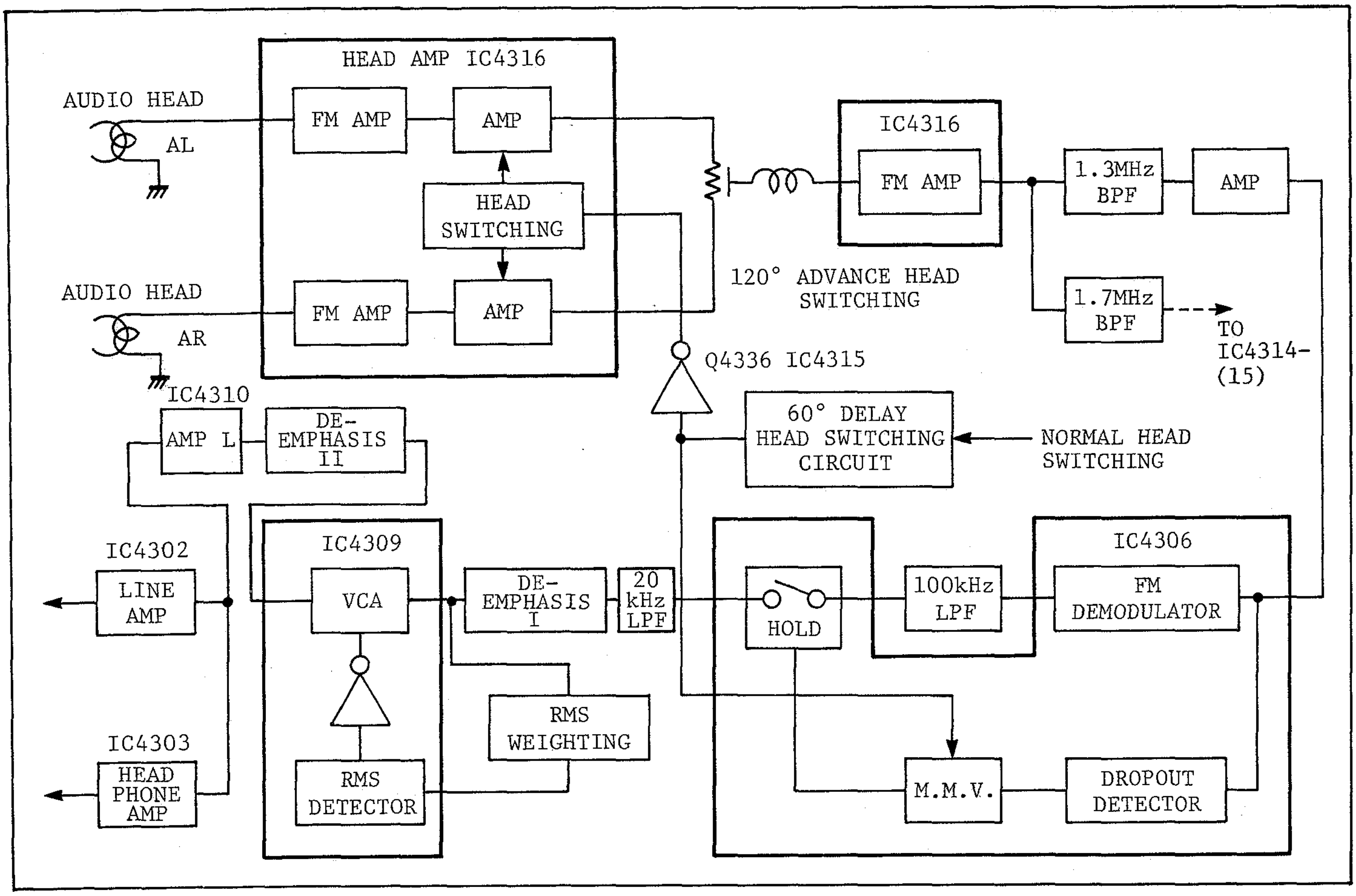

HEAD AMP IC4316
AUDIO HEAD
AL
FM AMP
AMP
HEAD SWITCHING
AUDIO HEAD
AR
FM AMP
AMP
IC4316
FM AMP
1.3MHz BPF
AMP
120° ADVANCE HEAD SWITCHING
1.7MHz BPF
TO IC4314-(15)
Q4336 IC4315
60° DELAY HEAD SWITCHING CIRCUIT
NORMAL HEAD SWITCHING
IC4310
AMP L
DE-EMPHASIS II
IC4302
LINE AMP
IC4309
VCA
DE-EMPHASIS I
20 kHz LPF
HOLD
100kHz LPF
IC4306
FM DEMODULATOR
RMS WEIGHTING
IC4303
HEAD PHONE AMP
RMS DETECTOR
M.M.V.
DROPOUT DETECTOR

Figure 7-13. Hi-Fi Audio Playback Process.

General Description

A simplified block diagram for the Hi-Fi audio playback process is shown in Figure 7-13.

HEAD AMP CIRCUIT

At this point, the individual intermittent channel signals are combined into a continuous luminance signal by the head switching signal. Note that the head switching signal for the audio head amplifier is 120° advanced from the normal head switching signal.
The combined signal is then amplified by a second FM stage inside IC4316 before it is sent to the individual channel band pass filters.

BPF

The mixed FM signals are then separated into the channel 1 and channel 2 signals by band pass filters that pass the 1.3MHz ± 150kHz and 1.7MHz ± 150kHz of the band width, respectively (Figure 7-14).
After the band pass filter, the left and right audio channels are processed separately.
Note that Figure 7-13 shows the remaining playback circuitry only for the left channel. Similar processing circuitry is also used for the right channel.

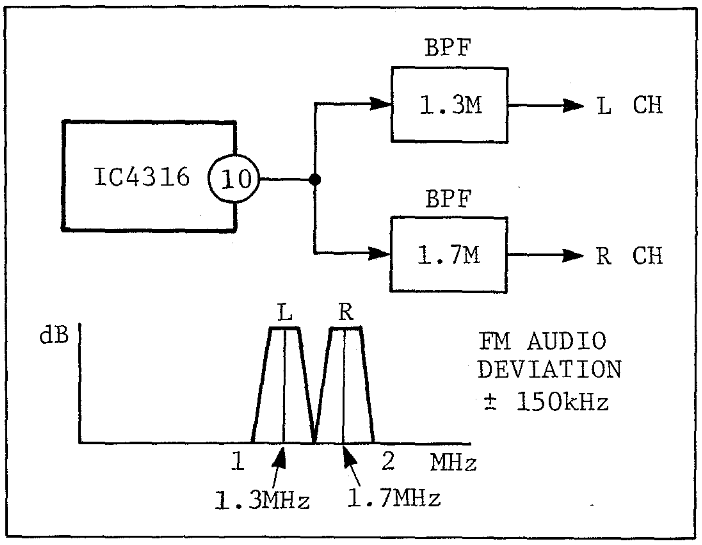

BPF
1.3M
L CH
IC4316
10
BPF
1.7M
R CH
dB
L
R
FM AUDIO
DEVIATION
± 150kHz
1
2
MHz
1.3MHz
1.7MHz

Figure 7-14. BPF.

FM DEMODULATOR

After the signal has been separated and amplitude limited, it is ready to be demodulated into amplituded modulation (AM) signal.
The demodulation process is performed by the FM demodulator.

DOC (Dropout Compensator Circuit)

Dropout is a momentary loss of playback RF signal from whatever cause (due to dirt on the tape or head, etc.)
The compensator is composed of a Dropout Detector, Gate, 100kHz LPF and Hold in a configuration as shown in Figure 7-15, and described below.
A Dropout signal (A) is detected by the Dropout Detector and sends pulse B to a monostable multivibrator whose duration is determined by the time constant set by external components (resistor R4441 and capacitor C4345 in channel 1.)
The MMV then outputs pulse (C) which enables the HOLD and causes the demodulated signal (D) to be maintained constant in the interval of the MMV as shown.
The MMV also outputs a pulse to the HOLD at the head switching points so that any loss of signal at these points is compensated. (This operation is not shown in Figure 7-15, but is treated in the detailed description section of the playback process.)
The 100kHz LPF is used to delay the phase of the audio signal and cut off the noise at the head switching point.

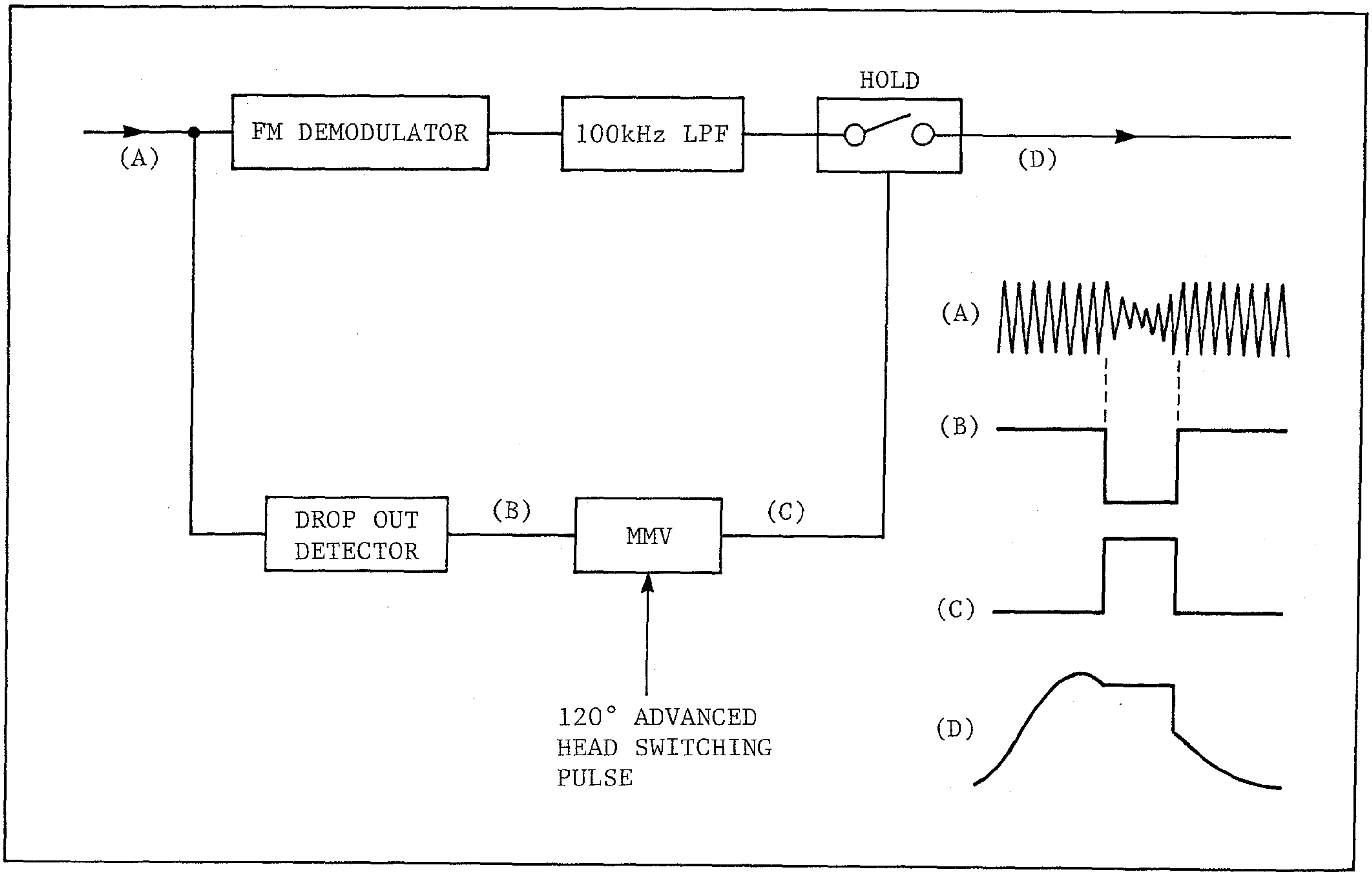

HOLD
FM DEMODULATOR
100kHz LPF
(A)
(D)
(A)
(B)
(C)
(D)
DROP OUT DETECTOR
(B)
MMV
(C)
120° ADVANCED HEAD SWITCHING PULSE

Figure 7-15. D.O.C. Process.

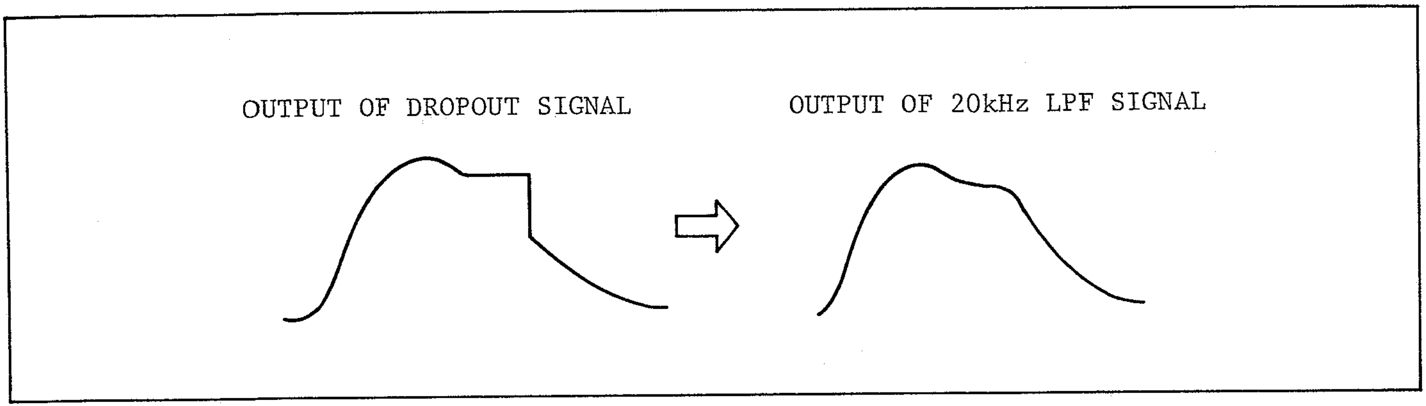


Figure 7-16. 20KHz LPF Waveform.

20kHz LPF

The dropout compensated audio signal is then fed to the 20kHz LPF. This LPF shapes the output of dropout signal as shown in Figure 7-16.

DE-EMPHASIS I

Because the audio signal was emphasized in the recording process, it must now be de-emphasized in playback. A simple R-C network performs this action.

RMS WEIGHTING

The de-emphasized audio signal is then fed to the RMS weighting circuit to restore the original frequency characteristic.
The RMS weighting circuit action in playback restores the original frequency characteristic because the playback weighted output characteristic is reversed by the inverter stage between the RMS Detector and the VCA as shown in Figure 7-13.

RMS DETECTOR

The RMS Detector develops the DC control voltage for the VCA as described in the use of this detector during the record mode. The RMS Detector characteristic is also inverted by the same inverter stage which reverses the weighting characteristic. In this way, the control voltage to the VCA is inverted to provide the expansion characteristic of the playback mode and restore the original dynamic range.

VCA (Voltage-Controlled Amplifier/ Attenuator)

The VCA varies the degree of amplification logarithmically in response to the incoming DC control voltage from the RMS Detector. Since the DC control voltage is reversed (as mentioned in the above paragraph), the VCA playback characteristic is reversed from the characteristic in record. In the record mode, the VCA serves as an attenuator when the input level is higher than the 0 dB standard level, and as an amplifier when the input level is lower than the standard level. In the playback mode, the VCA serves as an amplifier when the input level is higher than the 0 dB standard level, and as an attenuator when the input level is lower than the standard level.

DE-EMPHASIS II

The de-emphasis II circuit reduces the gain in the same frequency range which was pre-emphasized by the pre-emphasis II circuit in the record process. In this way, high frequency tape noise is reduced. This operation is performed by a simple RC network shown in the detail description section which follows.

AMP CIRCUIT

The restored audio signal is then amplified in IC4310 and finally sent to the LINE AMP IC4302 and HEAD PHONE AMP IC4303.

Detailed Description

This description will apply to both CH1 and CH2 although diagrams will be shown only for CH1 components.

HEAD AMP CIRCUIT

Figure 7-17 shows the head amplifier and switching circuits. FM audio signals from the rotary audio heads are first sent to IC4316 Pin 3 in CH1 (LCH) and Pin 5 in CH2 (RCH).
The intermittent signals are converted into continuous signals by the 120 degree advanced head switching signal which is produced by a 60 degree delayed head switching pulse supplied from IC4315.
The normal head switching signal used for the video signal is fed to two monostable multivibrators inside IC4315.

Referring to the waveforms in Figure 7-17, MMV I is triggered by the falling edge of the normal head switching pulse at IC4315, Pin 6 and produces the delayed waveform at IC4315, Pin 8, as shown. This is fed to MMV II which then produces the 60° delayed head switching pulse (the 50% duty cycle pulse). The 60° delay is finally converted to the required 120° advanced head switching pulse by the inverter Q4336 (since inverting the pulse is equivalent to 180° phase shift).
Both CH1 and CH2 audio RF signal are mixed at R4404 and then sent to 1.3MHz and 1.7MHz band pass filter through the FM AMP and buffer transistor Q4337.

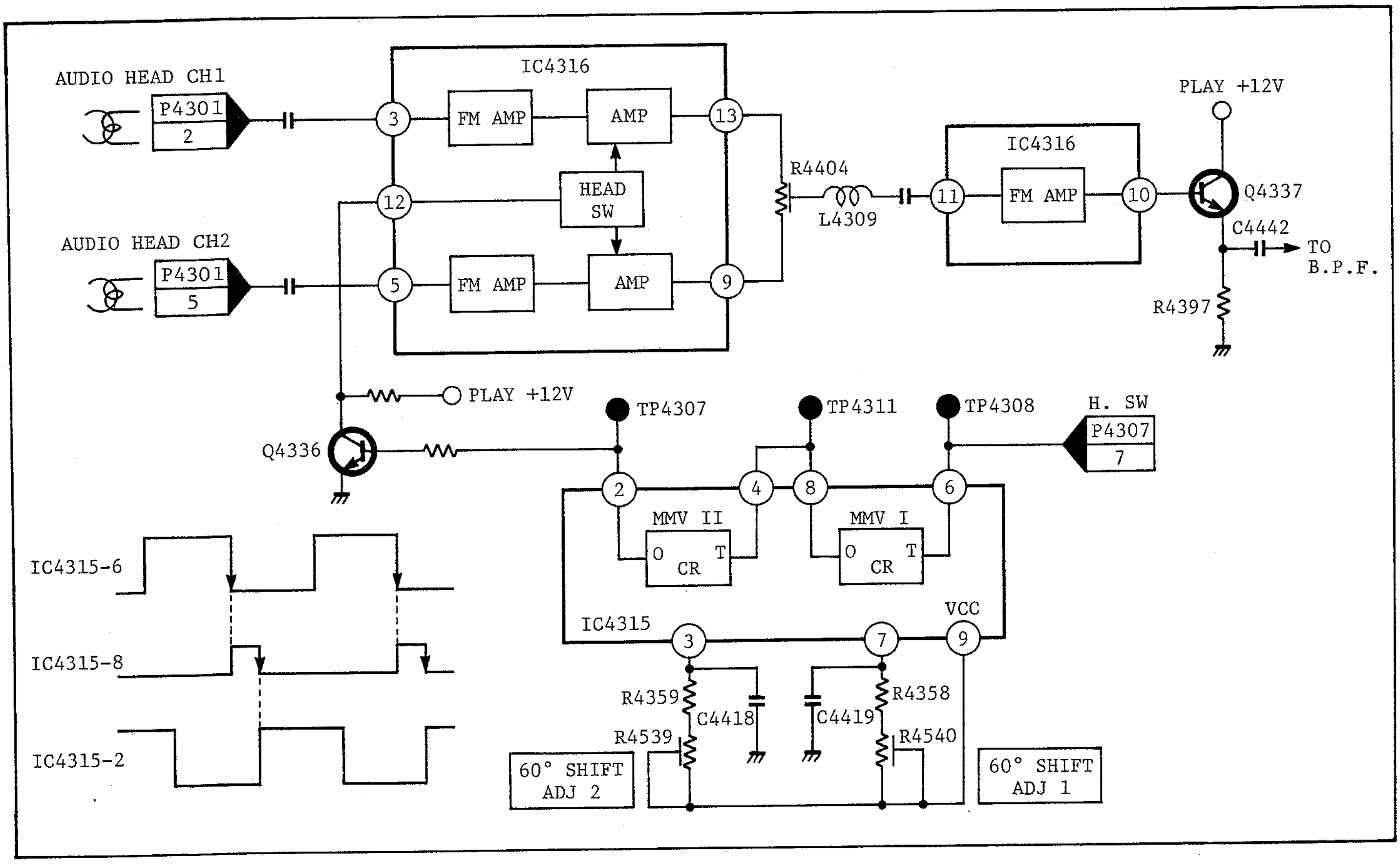

AUDIO HEAD CH1
P4301
2
IC4316
3
FM AMP
AMP
13
12
HEAD SW
AUDIO HEAD CH2
P4301
5
5
FM AMP
AMP
9
R4404
L4309
11
IC4316
FM AMP
10
PLAY +12V
Q4337
C4442
TO B.P.F.
R4397
PLAY +12V
Q4336
TP4307
TP4311
TP4308
H. SW
P4307
7
2
4
8
6
MMV II
MMV I
O
T
CR
IC4315
3
7
VCC
9
IC4315-6
IC4315-8
IC4315-2
R4359
C4418
C4419
R4358
R4539
R4540
60° SHIFT ADJ 2
60° SHIFT ADJ 1

Figure 7-17. Head Switching Circuit.

BPF

Referring to Figure 7-18, the mixed audio FM signals are then separated into channel 1 and channel 2 signals by the band pass filters FL4305, FL4306 which deal with the 1.3MHz ± 150kHz and 1.7MHz ± 150kHz of the band width respectively. Figures 7-19 and 7-20 show the characteristics of the two band pass filters. The separated signals are then amplified by three transistor stages (Q4342, Q4341 and Q4340 for the left channel, and Q4345, Q4344, and Q4343 for the right channel).

FM DEMODULATOR

This is a typical phase locked loop circuit. The phase comparator develops a varying D.C. voltage depending upon the phase difference between the FM input and the VCO. This D.C. voltage is fed back to the VCO causing it to track the frequency variations of the input. In this way, the FM signal is converted into an AM signal at the phase comparator output.

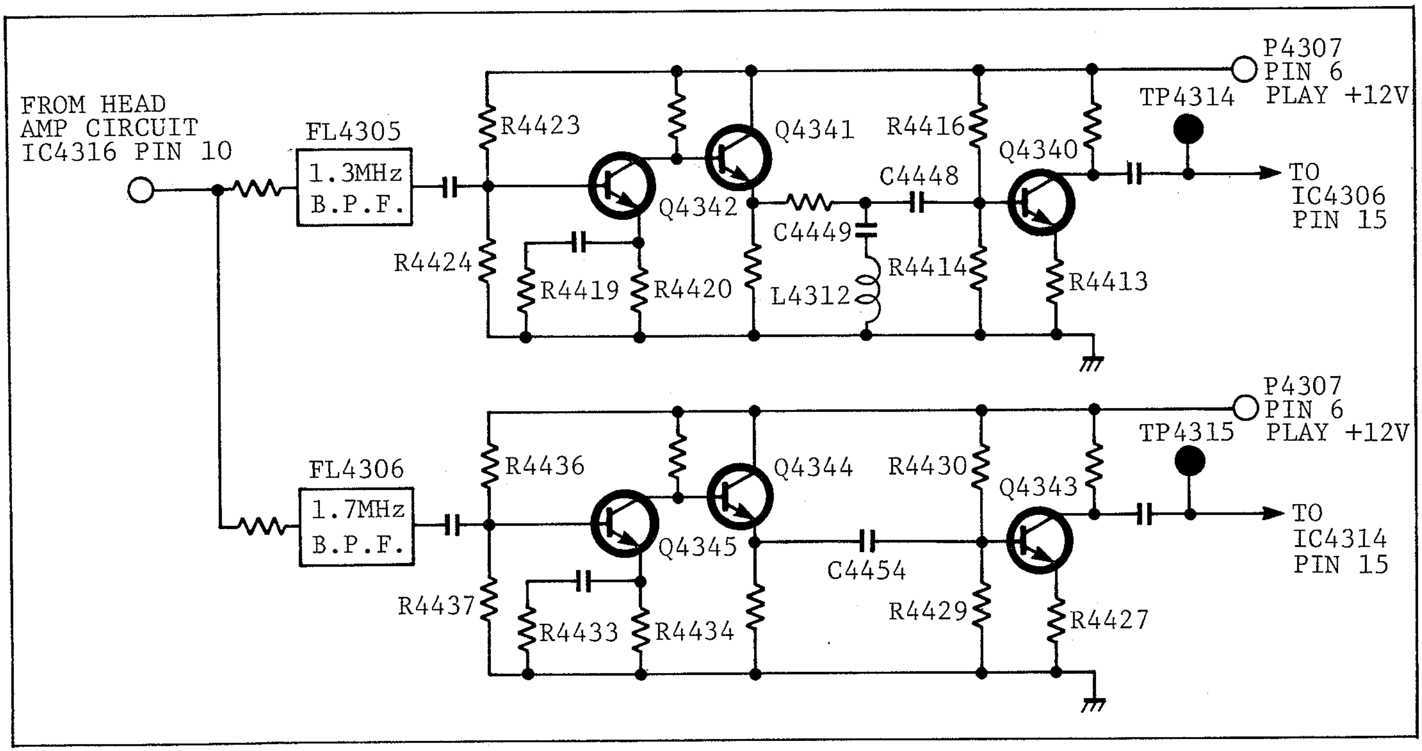

FROM HEAD AMP CIRCUIT IC4316 PIN 10
FL4305
1.3MHz B.P.F.
R4423
R4424
R4419
R4420
Q4342
Q4341
R4416
C4448
C4449
L4312
R4414
Q4340
R4413
TP4314
P4307 PIN 6 PLAY +12V
TO IC4306 PIN 15
FL4306
1.7MHz B.P.F.
R4436
R4437
R4433
R4434
Q4345
Q4344
R4430
C4454
R4429
Q4343
R4427
TP4315
P4307 PIN 6 PLAY +12V
TO IC4314 PIN 15

Figure 7-18. 1.3MHz and 1.7MHz Band Pass Filter.

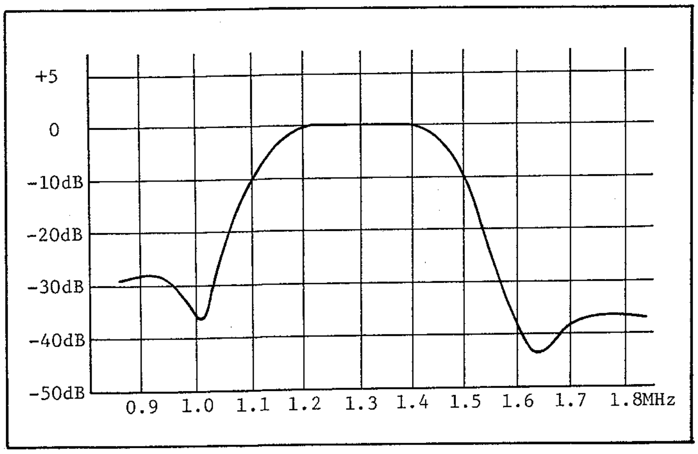


Figure 7-19. 1.3MHz BPF Frequency Characteristic.

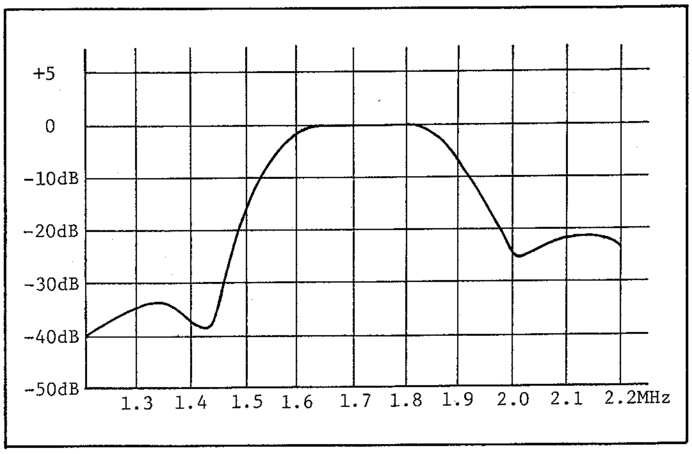


Figure 7-20. 1.7MHz BPF Frequency Characteristic.

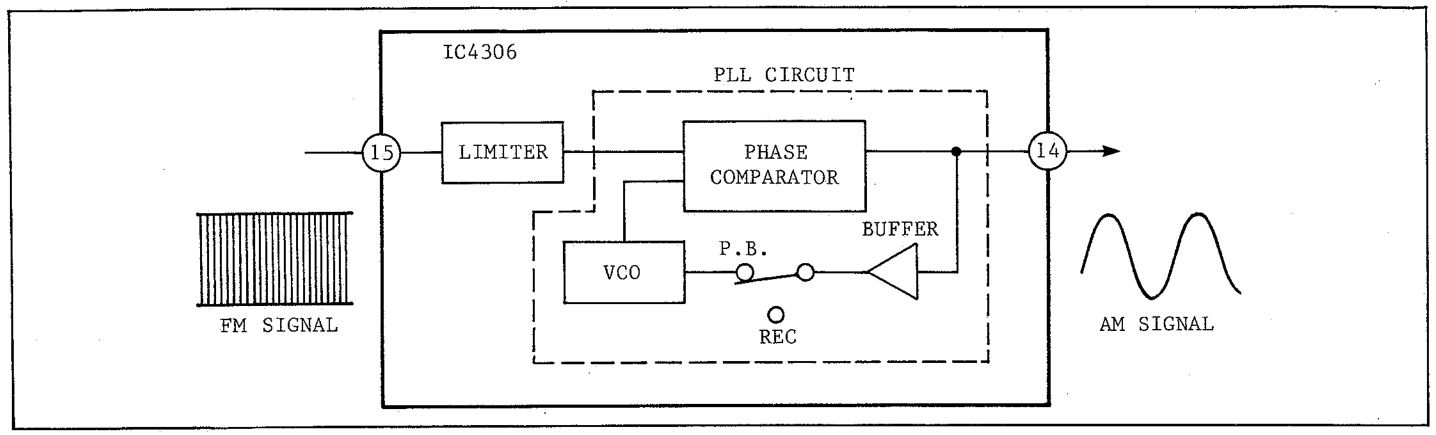

IC4306
PLL CIRCUIT
15
LIMITER
PHASE
COMPARATOR
14
BUFFER
P.B.
VCO
REC
FM SIGNAL
AM SIGNAL

Figure 7-21. FM Demodulator.

DOC (Dropout Compensation Circuit)

Figure 7-22 shows the circuit for dropout compensation, and Figure 7-23 shows the waveforms associated with the referenced points in the circuit.
Two types of dropout compensation are illustrated in Figure 7-23; one is compensation for signal loss at the head switching points, and the other is compensation for signal loss at any time between switching points.
Waveforms D through H apply to the action for head switching point compensation, while waveforms A, B, C and F through H apply for dropout compensation action at other times.

1. If dropout occurs between head switching points as illustrated for the FM signal in Figure 7-23, the following sequence of actions takes place:

   a. A negative going pulse (A) appears at the output of the dropout detector, and is inverted to produce the positive going pulse (B) at one input to OR Gate 2.

   b. The positive pulse (B) produces the t1 portion of the HOLD waveform (G) at the output of OR Gate 2.

   c. The rising edge of waveform (A) produces the trigger 2 waveform (C) at one input to OR Gate 1.

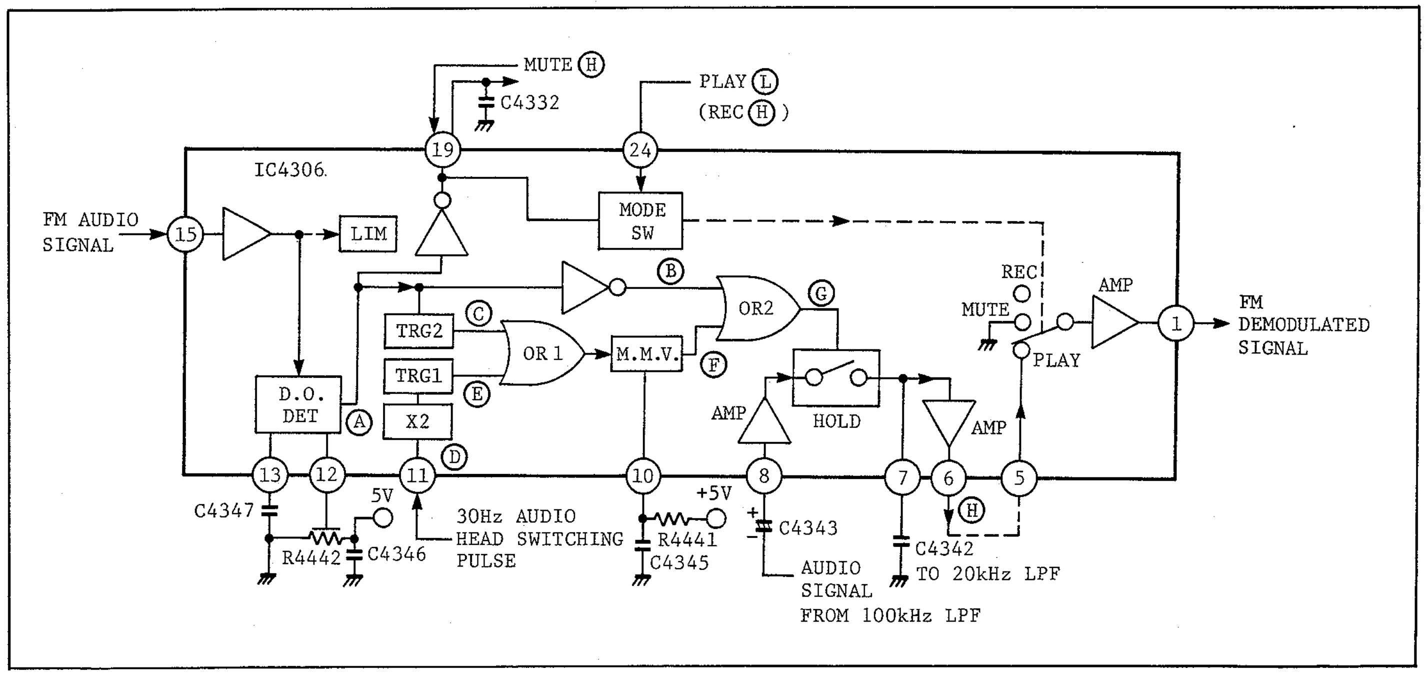

MUTE Ⓗ
C4332
PLAY Ⓛ
(REC Ⓗ)
IC4306
19
24
FM AUDIO
SIGNAL
15
LIM
MODE
SW
Ⓑ
Ⓖ
REC
MUTE
AMP
TRG2
Ⓒ
OR 1
OR2
M.M.V.
Ⓕ
TRG1
Ⓔ
PLAY
1
FM
DEMODULATED
SIGNAL
D.O.
DET
Ⓐ
X2
AMP
HOLD
AMP
Ⓓ
13
12
11
10
8
7
6
5
C4347
5V
30Hz AUDIO
HEAD SWITCHING
PULSE
+5V
R4441
C4345
C4343
Ⓗ
R4442
C4346
AUDIO
SIGNAL
FROM 100kHz LPF
C4342
TO 20kHz LPF

Figure 7-22. Dropout Compensate Circuit.

   d. Waveform (C) passes OR Gate 1 and triggers the MMV which produces the pulse (F) of duration t2.

   e. Pulse (F) passes OR Gate 2 and produces the t2 portion of HOLD waveform (G).

   The above operation enables the HOLD circuit for the duration t1+t2 and maintains the audio signal (H) constant over this interval.

2. Compensation at the head switching points is performed as follows:

   a. Each edge of the head switching waveform (D) produces a trigger (E) at the other input to OR Gate 1.

   b. Waveform (E) passes OR Gate 1 and triggers the MMV to produce a pulse (F).

   (Note that this action is similar to step 1.d above except that the MMV is triggered from the alternate input to OR Gate 1.)

   c. Pulse (F) passes OR Gate 2 and produces the HOLD (G) at the head switching points.
   The above operation enables the HOLD circuit for approximately 17 µs (t2), and maintains the audio signal (H) constant for this interval at each head switching point.

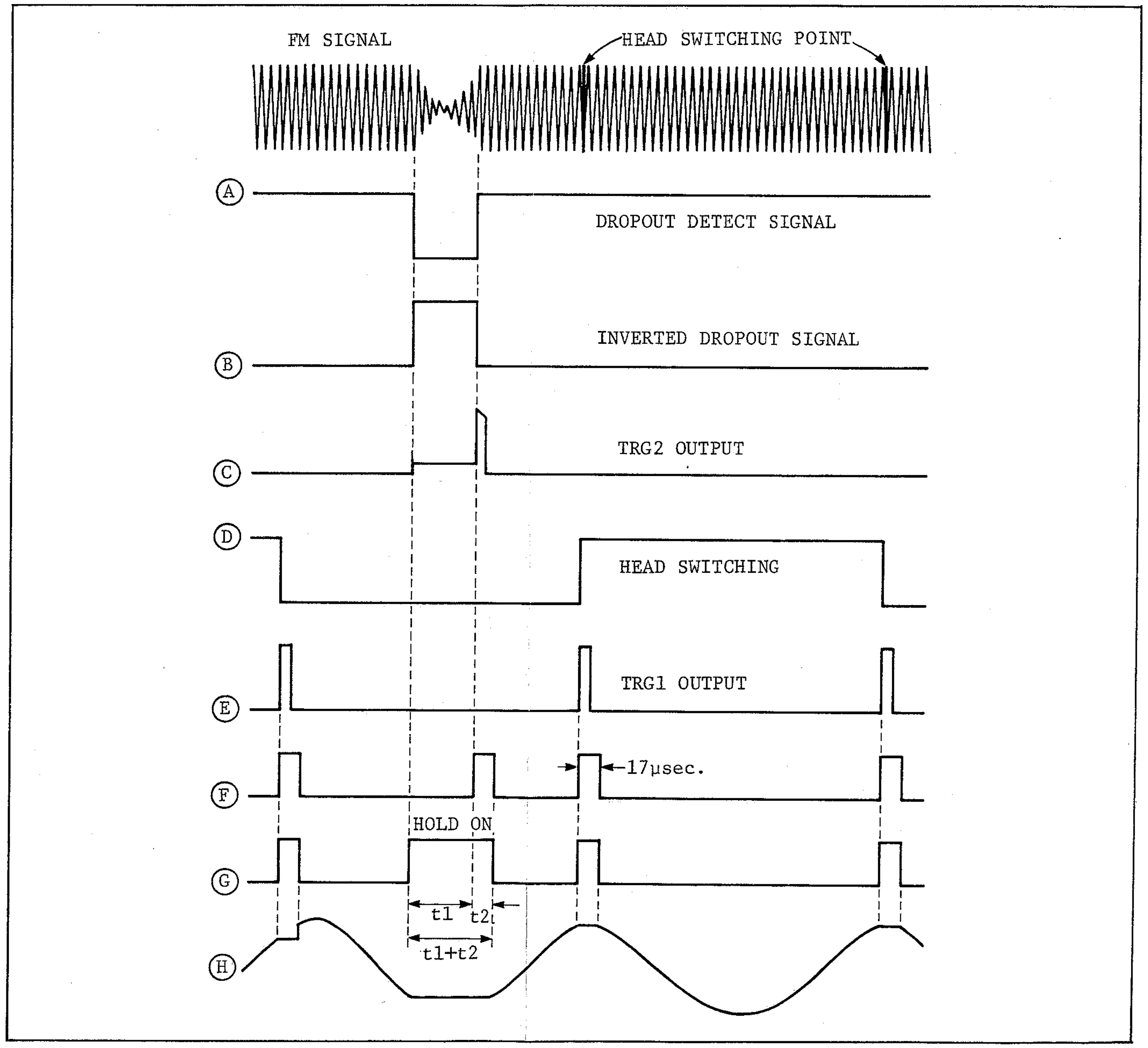


Figure 7-23. Dropout Compensator Waveform.

20kHz LPF AND 100kHz LPF

Before the demodulated audio signal is sent through the Hold circuit for dropout compensation, the signal is first passed through the 100kHz LPF. (Refer to Figure 7-15 which shows the position of the 100kHz LPF in the Dropout circuit process.)
Referring again to Figure 7-22, the signal from the 100kHz LPF enters IC4306 Pin 8 where it passes through the Hold circuit for dropout compensation. The compensated output then exits IC4306 at Pin 6 and is applied to a 20kHz LPF VJB00B80 (VJB00B79 for CH2).
After the 20kHz LPF, the demodulated signal is ready to input to the noise reduction circuits which follow.

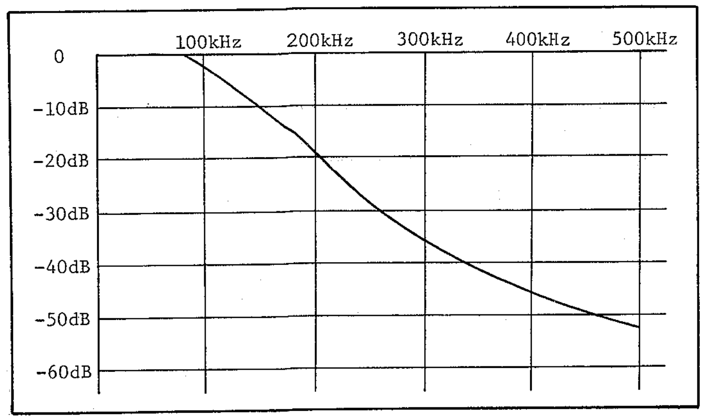


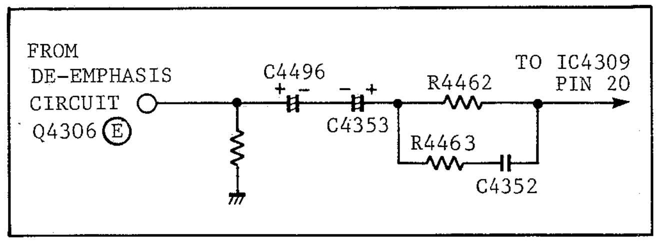
Figure 7-24. 100KHz LPF Frequency Characteristic Chart.

DE-EMPHASIS I

Pre-emphasized signals by the emphasis II circuit must be de-emphasized in the playback mode. Figure 7-25 shows the de-emphasis I circuit which is composed of R4392, C4350 and R4459.
The de-emphasized signal is then amplified by Q4303 and then goes to the RMS weighting circuit through the ON transistors Q4305 and Q4306.

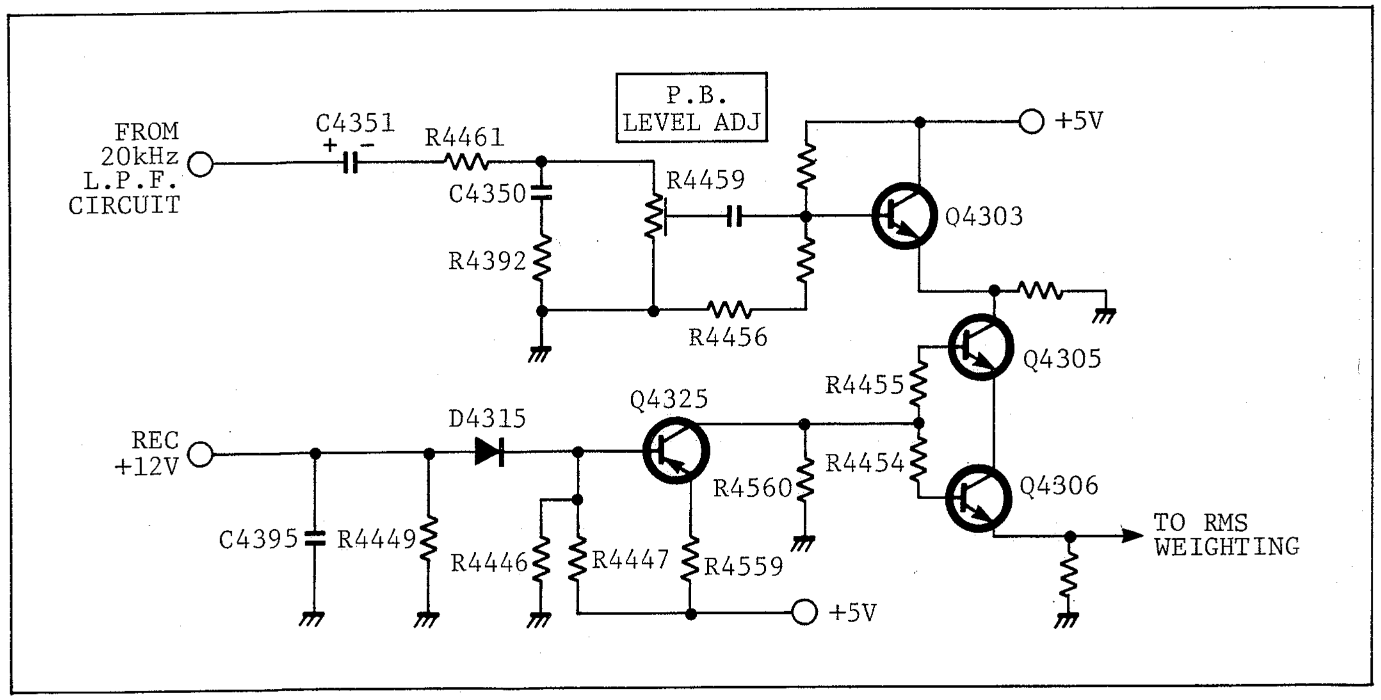
RMS WEIGHTING

Figure 7-26 shows the playback weighting circuit which consists of the same value RC components as the record weighting circuit.



FROM DE-EMPHASIS CIRCUIT Q4306 Ⓔ
C4496
C4353
R4462
R4463
C4352
TO IC4309 PIN 20

Figure 7-26. RMS Weighting.



FROM 20kHz L.P.F. CIRCUIT
C4351
R4461
C4350
R4392
P.B. LEVEL ADJ
R4459
R4456
Q4303
+5V
Q4305
Q4306
R4455
R4454
Q4325
D4315
R4560
REC +12V
C4395
R4449
R4446
R4447
R4559
+5V
TO RMS WEIGHTING

Figure 7-25. De-Emphasis I Circuit.

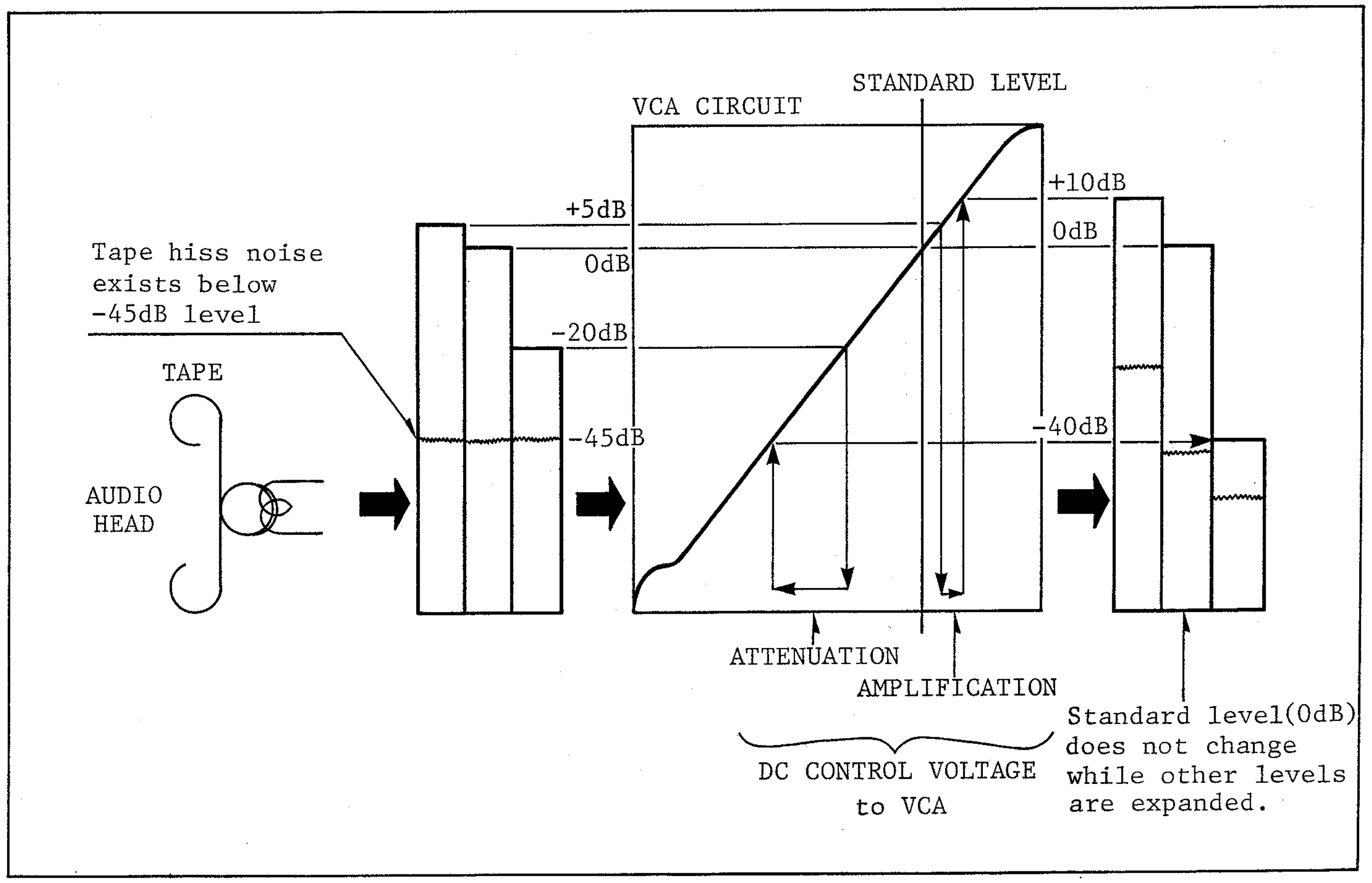
The same weighting circuit characteristic can be used because the control voltage (which includes the weighting circuit output) to the VCA is inverted in the playback process as mentioned in the playback general description. This effectively inverts the playback weighting characteristic and restores the original unweighted frequency response.

RMS DETECTOR

To control the VCA circuit, the RMS detector circuit detects.
The root mean square value of the audio signal and converts it to a DC voltage as was described in the recording mode.
The playback process uses the same type of RMS detector as was used during the record process.
(See recording RMS detector circuit)

VCA (Voltage Controlled Amplifier/ Attenuator)

The playback VCA performs logarithmic expansion to restore the original dynamic range of the audio signal.
Expansion is performed by the same type of VCA circuit as was used in the record process to perform compression because of the inverter stage between the RMS Detector and the VCA. Figure 7-27 shows the expansion characteristic of the playback VCA, and should be compared with Figure 7-4 which shows the compression characteristic of the record VCA.
Note that during playback, input levels above 0 dB are amplified while levels below 0 dB are attenuated (just the reverse of the actions performed by the record VCA).
An example for an input below 0 dB is illustrated in the block diagram of Figure 7-28 and graphs of Figure 7-29 and 7-30.



Tape hiss noise exists below -45dB level
TAPE
AUDIO HEAD
VCA CIRCUIT
STANDARD LEVEL
+5dB
0dB
-20dB
-45dB
+10dB
0dB
-40dB
ATTENUATION
AMPLIFICATION
DC CONTROL VOLTAGE to VCA
Standard level(0dB) does not change while other levels are expanded.

Figure 7-27. Playback Input/Output Characteristic of VCA Circuit.

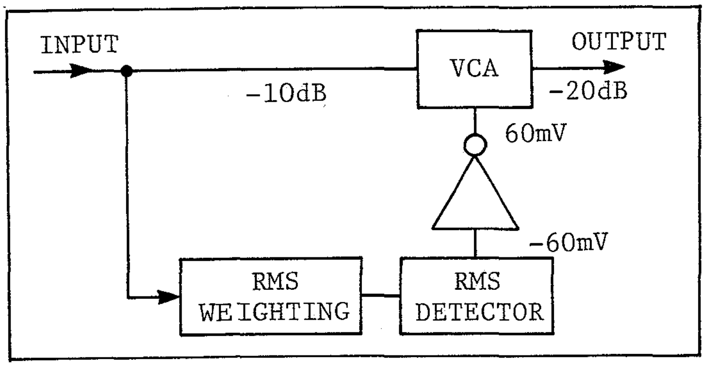

INPUT
OUTPUT
VCA
-10dB
-20dB
60mV
-60mV
RMS WEIGHTING
RMS DETECTOR

Figure 7-28. Expand Dinamic Range Process.

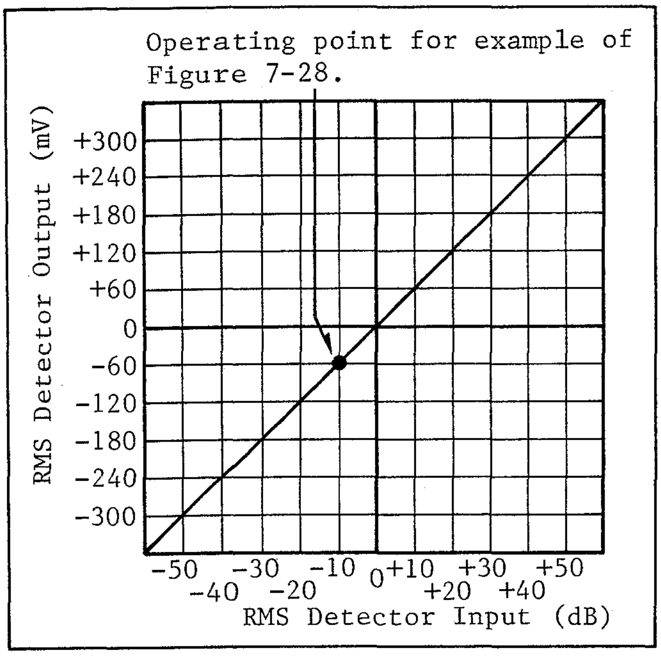


Figure 7-29. RMS Detector Characteristic.

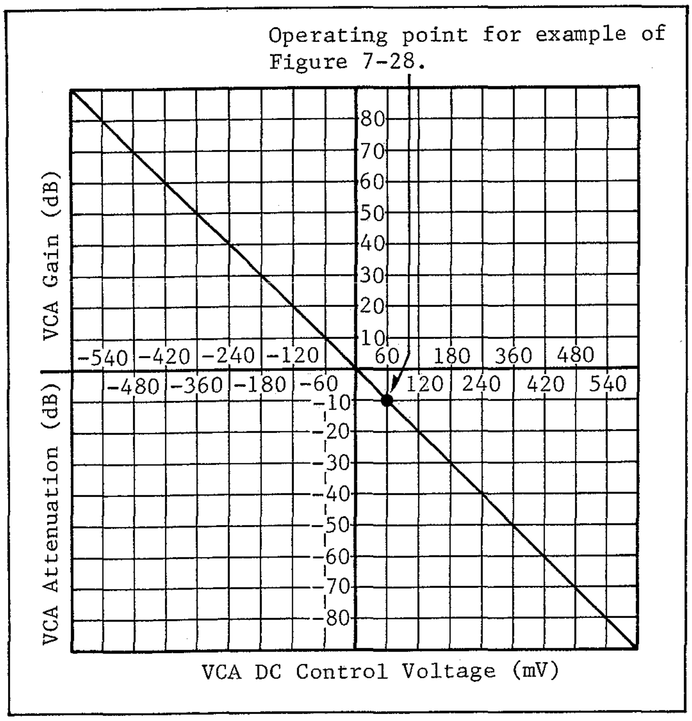


Figure 7-30. VCA Circuit Characteristic.

Referring first to the RMS Detector characteristic in Figure 7-29, -10 dB input to the Detector results in -60mV at the Detector output which is inverted and applied as +60mV at the VCA. Referring next to the gain characteristic of Figure 7-30, +60mV control DC voltage to the VCA corresponds to a VCA attenuation of 10 dB, and the resulting VCA input/output of -10 dB/-20 dB, as shown in Figure 7-28.

DE-EMPHASIS II

The expanded audio signal from the VCA is then applied to the de-emphasis II circuit of Figure 7-31. This provides the characteristic shown in Figure 7-32 and results in noise reduction by attenuation of the high frequencies.

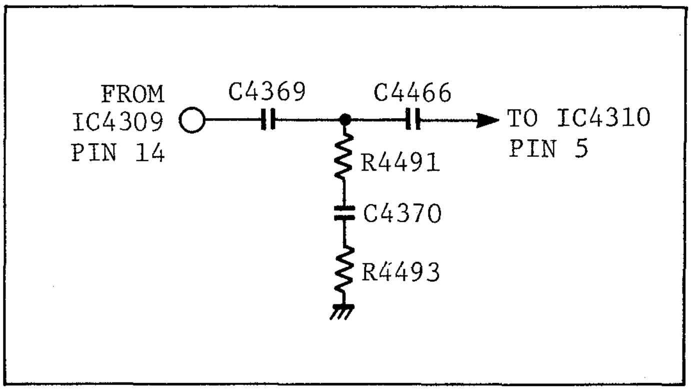

FROM IC4309 PIN 14
C4369
C4466
TO IC4310 PIN 5
R4491
C4370
R4493

Figure 7-31. De-Emphasis II Circuit.

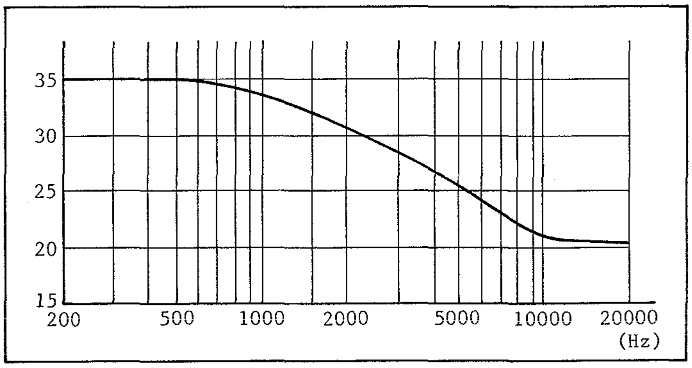


Figure 7-32. De-Emphasis II Characteristic.

PLAYBACK AMP CIRCUIT

The de-emphasized signal is then amplified by IC4310 (Figure 7-33), and fed to the REC/MUTE/PB switch in IC4306.
The play low signal is applied to IC4306, Pin 24 (through transistors Q4326, Q4324) so that PB is selected at the REC/MUTE/PB switch. Therefore, the playback audio signal is outputted to the Line Amplfier (IC4302) and Headphone Amplifier (IC4303).

MUTING CIRCUIT

If a long dropout period (about 4 to 5 msec) occurs, or if audio carrier signals are missing, the mute position is selected inside of IC4306 (see Figure 7-33).

At the same time, the dropout detector outputs a high signal from IC4306, Pin 19 to the Comparator in IC4311 (Figure 7-34). This results in a low signal from the Comparator output which is applied to D4314, and Q4317 turns off. The Q4317 collector high signal turns on Q4320 which then turns off Q4319. When Q4319 goes off, the FM L point at P4306, Pins 1 and 2 goes high and signals the Audio Control Circuit to switch from Hi-Fi FM playback mode to Normal Audio playback mode.

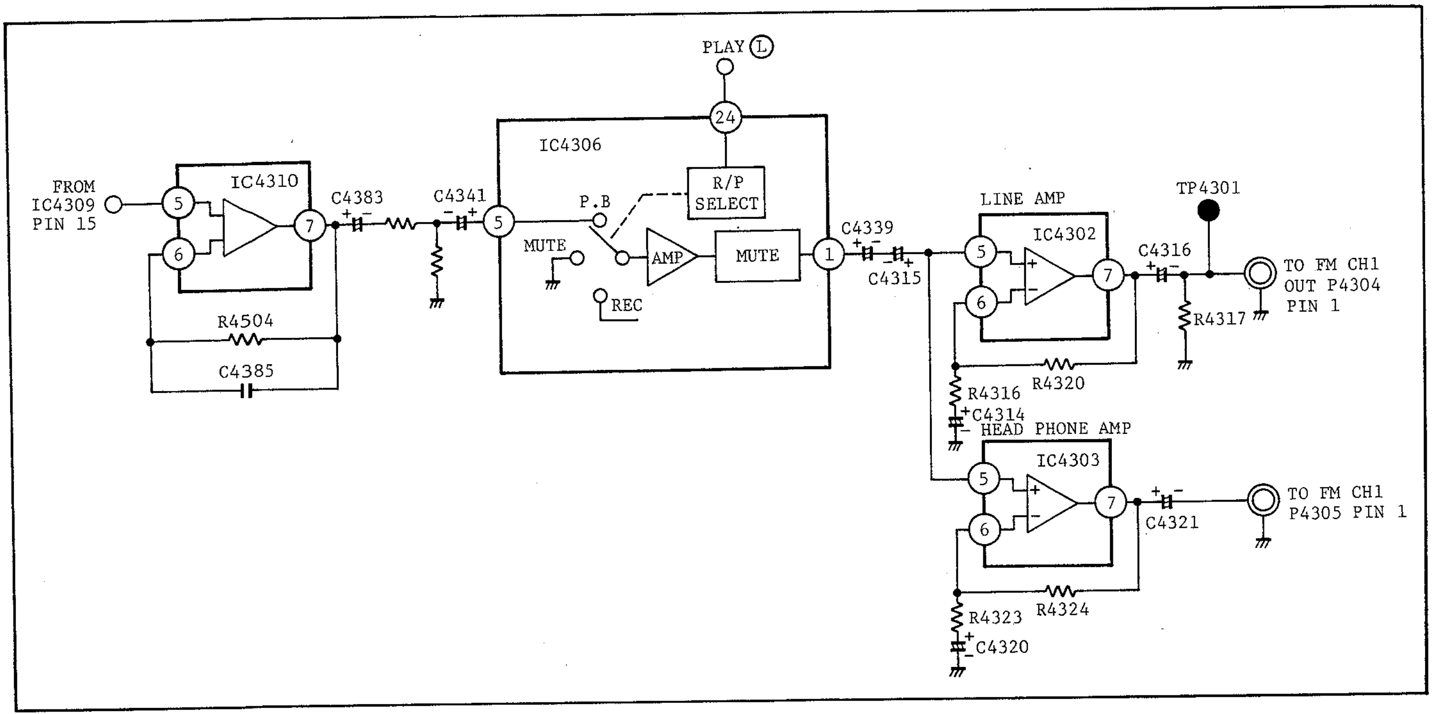

PLAY Ⓛ
24
IC4306
R/P
SELECT
FROM
IC4309
PIN 15
IC4310
5
6
7
C4383
C4341
5
P.B
MUTE
AMP
MUTE
REC
1
C4339
C4315
R4504
C4385
LINE AMP
IC4302
5
6
7
TP4301
C4316
TO FM CH1
OUT P4304
PIN 1
R4317
R4316
R4320
C4314
HEAD PHONE AMP
IC4303
5
6
7
C4321
TO FM CH1
P4305 PIN 1
R4323
R4324
C4320

Figure 7-33. Playback Amp Circuit.

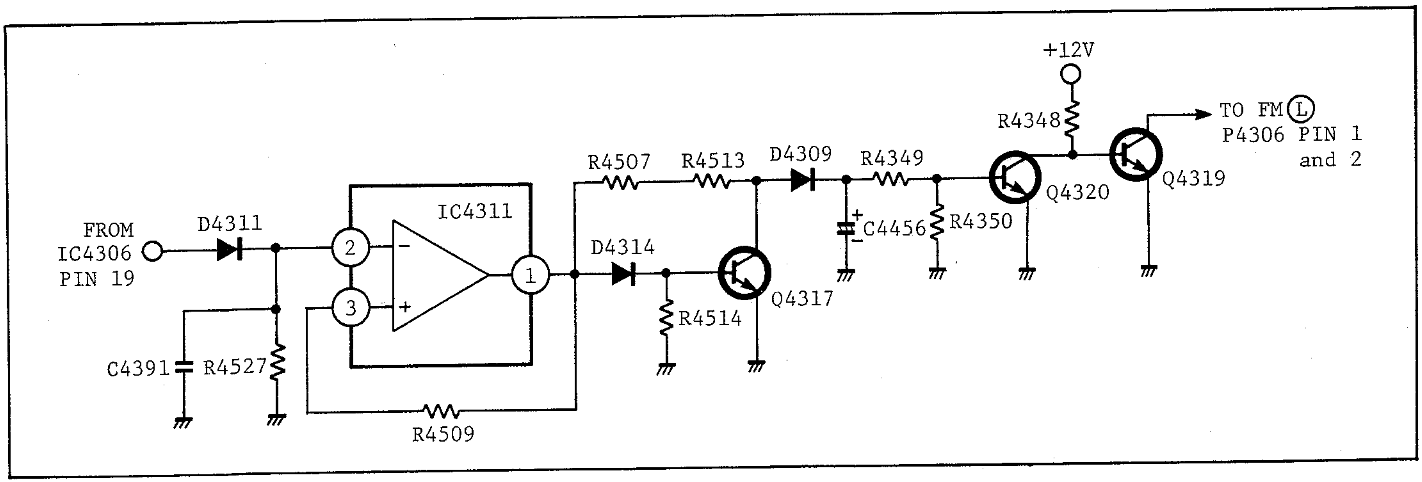

+12V
R4348
TO FM Ⓛ
P4306 PIN 1
and 2
R4507
R4513
D4309
R4349
Q4320
Q4319
FROM
IC4306
PIN 19
D4311
IC4311
2
3
1
D4314
C4456
R4350
R4514
Q4317
C4391
R4527
R4509

Figure 7-34. Muting Circuit.

AUDIO CONTROL CIRCUIT

General Description

The Audio Control Circuit performs a number of functions needed for the FM Hi-Fi audio system in the AG-6800. These functions are:

1. To provide noise free DC power to the FM Audio circuits.
2. To eliminate pop noise during switching operations.
3. To provide the correct amplitude and inhibit control of the Head Switching pulse for the FM Audio Circuits.
4. To mute the Hi-Fi audio during search mode.
5. To provide remote reset of the tape counter.
6. To supply controlled drive for the Hi-Fi indicator, Record Error indicator, and Mode Lock indicator.
7. To drive the channel 1 and channel 2 audio level meters.
8. To control the Hi-Fi/Normal audio select circuit.

Detailed Description

1. Hi-Fi DC POWER FILTER CIRCUITS

The Audio Control Circuit board includes three one-transistor power circuits (figure 8-1 ∿ 8-3). Figures 8-1 and 8-2 are simple low pass RC stages which provide filtered +12V and +12V PLAY, while figure 8-3 includes a 5 volt zener diode to provide filtered +5 volts. Each circuit is briefly described below.

+12V DC CIRCUIT (Figure 8-1)
The +12 volt supply is applied to the Q9 base through the R21, C13 network. The RC filter effectively integrates power noise and provides filtered +12 volt power to the Hi-Fi audio circuit through P4107 pin 1.

PLAY +12V CIRCUIT (Figure 8-2)
The PLAY +12V circuit is similar to the +12V circuit of figure 1 except that the input is received from the Video Control and System Control boards.

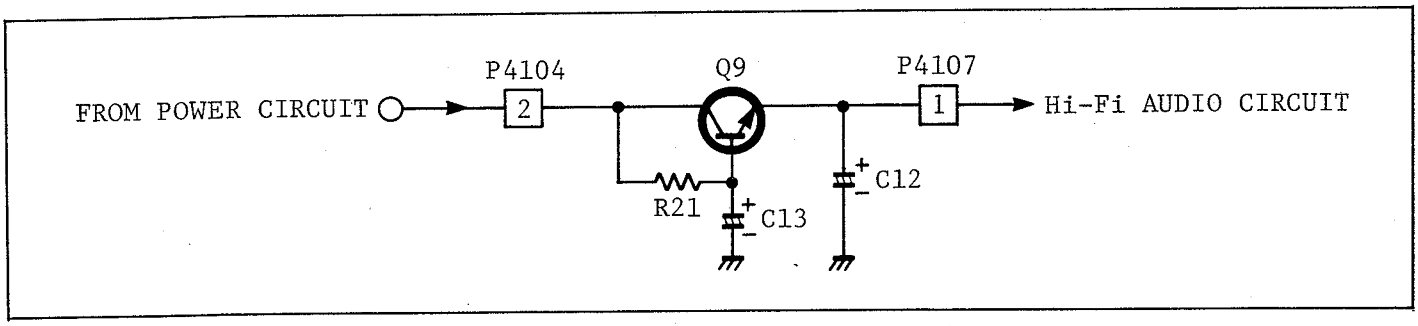

FROM POWER CIRCUIT
P4104
2
Q9
P4107
1
Hi-Fi AUDIO CIRCUIT
R21
C13
C12

Figure 8-1. +12V DC Filter Circuit.

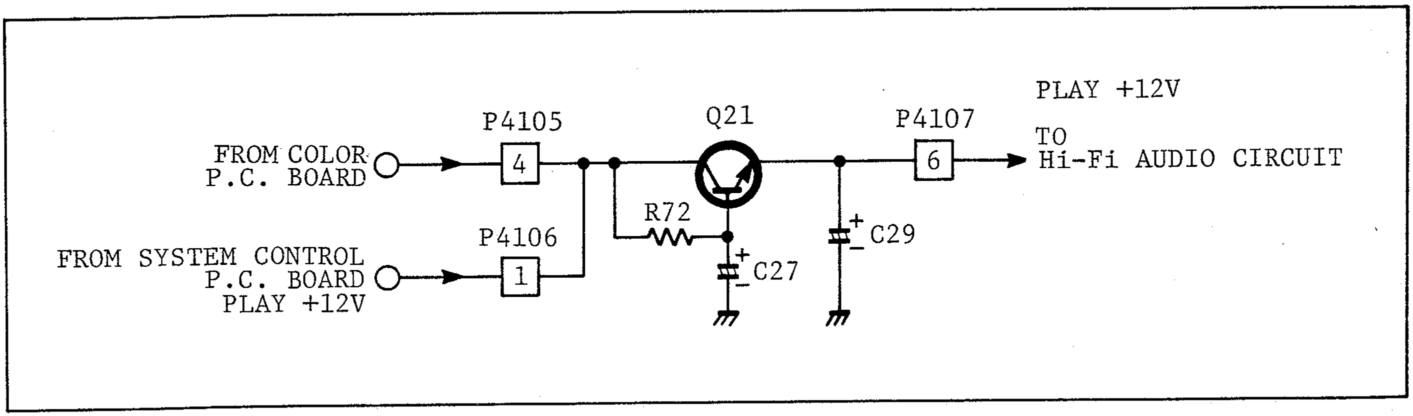

FROM COLOR P.C. BOARD
P4105
4
Q21
P4107
6
PLAY +12V
TO Hi-Fi AUDIO CIRCUIT
R72
P4106
1
FROM SYSTEM CONTROL P.C. BOARD PLAY +12V
C27
C29

Figure 8-2. PLAY +12V Filter Circuit.

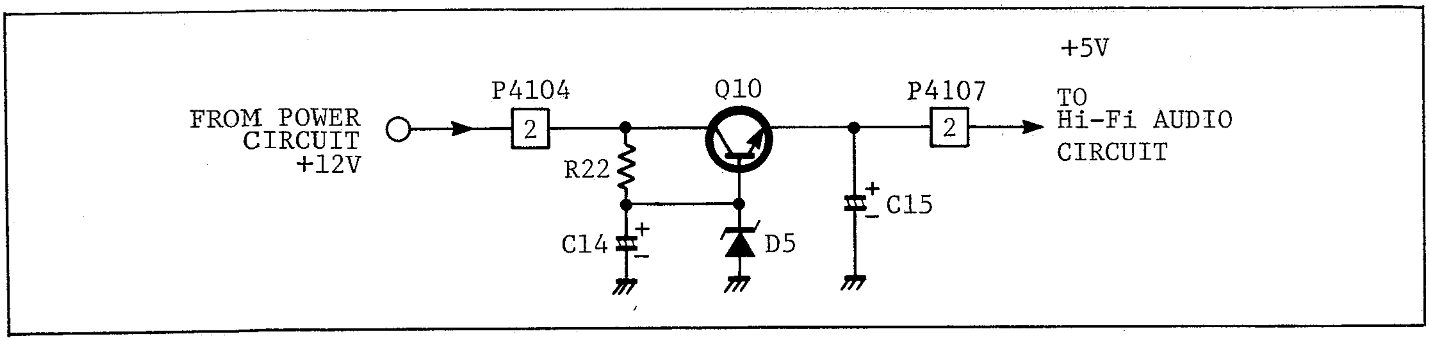


Figure 8-3. +5V Power Filter Circuit.

+5V DC POWER FILTER CIRCUIT
(Figure 8-3)
The +5V volt power circuit is also similar to the +12 volt circuit except that the filtered voltage is limited to 5 volts by the zener diode D5 across C14. This results in filtered +5 volts output at P4107, pin 2.

2. POP NOISE ELIMINATOR CIRCUITS

The following two circuits (Figures 8-4 and 8-6) are used to eliminate pop noise during mode switching and power ON/OFF switching.

ELIMINATE POP NOISE DURING VV TO EE OR EE TO VV

The Hi-Fi audio circuit must eliminate the pop noise whenever the unit switches from EE to VV (or from VV to EE).
This function is performed by comparator circuits shown in Figures 8-4 and 8-6. Waveforms associated with these circuits is given in Figures 8-5 and 8-7 respectively.
Referring first to Figures 8-4 and 8-5, the EE +12V pulse (a) from system control is integrated by R44, C20 and applied to comparator IC2 as waveform (b). R46 and R47 apply +6 volts reference to the other input of the comparator. The result is the delayed EE +12V pulse (c) at the comparator output. This delayed pulse is used by the switching circuits in the Hi-Fi Audio Circuit.
Referring next to Figures 8-6 and 8-7, the same EE +12 volt pulse from system control is also applied to the two-level comparator IC2 through differentiator C23 and R61. Network R57, R58 and R59 provides +7V and +5V reference to the comparators.
The differentiated rising edge of the EE +12V waveform produces pulse (c) at the lower comparator output, and the differentiated falling edge produces pulse (d) at the upper comparator output. These pulses are combined to produce the double pulse waveform (e) at the input to Q19.
Each negative going pulse turns on Q19 which then turns on Q5 and Q6. As a result, the Hi-Fi Audio signal is muted during the interval of each pulse as shown in waveform (f).
Referring back to Figure 8-5, note that the delay at the leading and falling edges of the delayed EE +12 volt waveform (c) correspond to the mute intervals in waveform (f) of Figure 8-7.

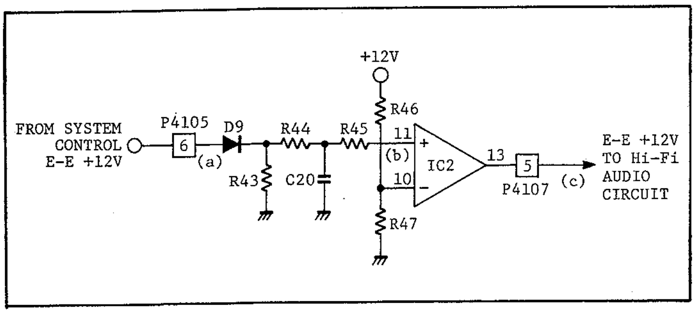


Figure 8-4. Pop Noise Elimination Circuit (During VV to EE or EE to VV).

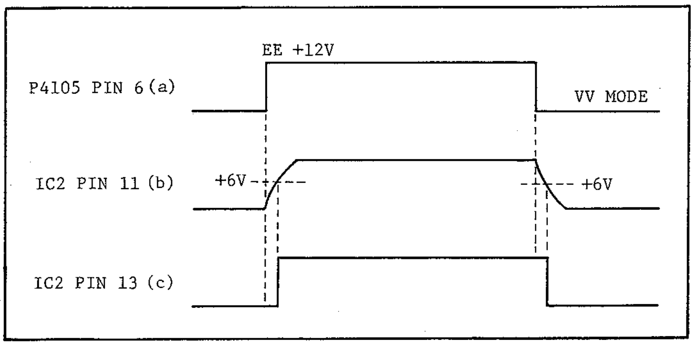


Figure 8-5. Pop Noise Elimination Circuit Waveforms.

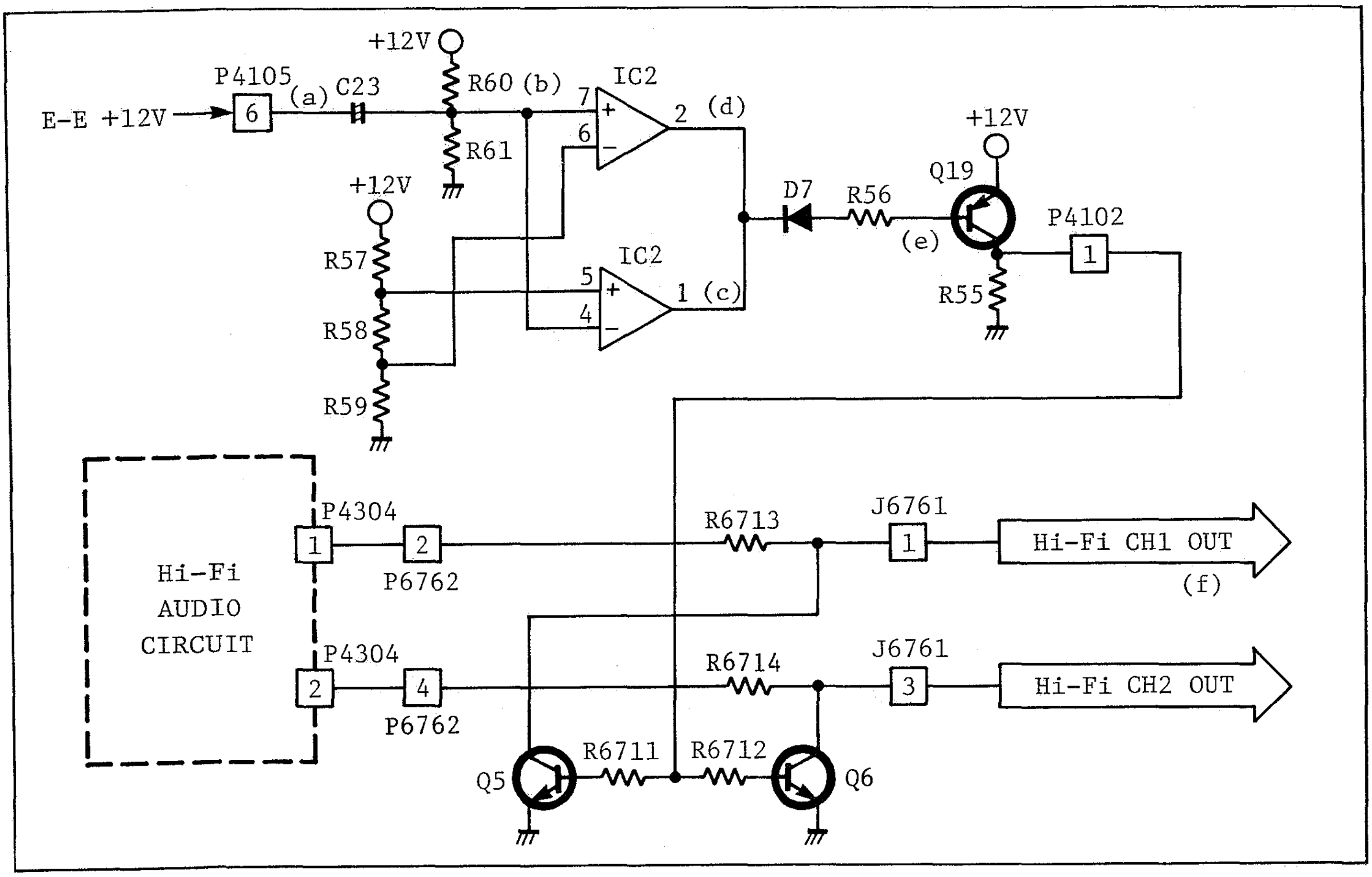

E-E +12V
P4105
6
(a)
C23
+12V
R60 (b)
R61
IC2
7
6
2 (d)
+12V
Q19
D7
R56
(e)
P4102
1
R55
+12V
R57
R58
R59
IC2
5
4
1 (c)
Hi-Fi
AUDIO
CIRCUIT
P4304
1
2
P6762
R6713
J6761
1
Hi-Fi CH1 OUT
(f)
P4304
2
4
P6762
R6714
J6761
3
Hi-Fi CH2 OUT
Q5
R6711
R6712
Q6

Figure 8-6. Muting Pulse Generator.

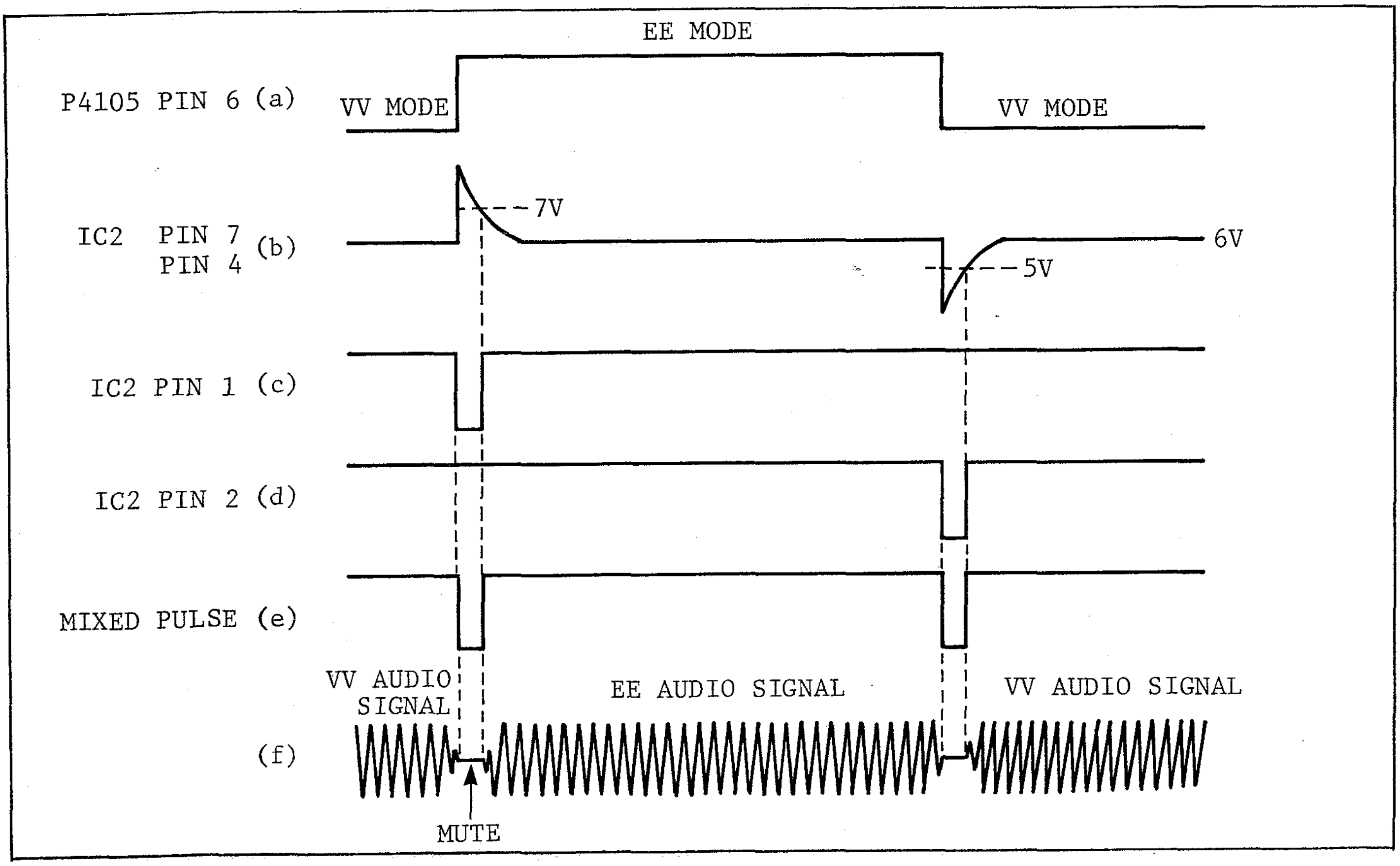


Figure 8-7. Muting Waveform.

ELIMINATE POP NOISE DURING POWER SWITCH ON/OFF

The Hi-Fi audio circuit must eliminate the pop noise when power is switched ON and OFF.
This function is performed by the circuit shown in Figure 8-8 which uses the same transistor stages (Q15, Q5 and Q6) as the Muting Pulse Circuit of Figure 8-6.
When power is applied, waveform (a) appears at the collector of Q19 and the output at the Q19 emitter goes high.
The integrated waveform (b) is developed by R53, C22 and applied to the base of Q19.

The integrated waveform provides a delay before Q19 is turned off at the 11.4 volt switching point. When this occurs, Q19 emitter goes low and mutes the Hi-Fi audio signals through ON transistors Q5 and Q6 (just as in the circuit of Figure 8-6).

HEAD SWITCHING PULSE CIRCUIT

This circuit (Figure 8-9) changes the 12 volt Head Switching Pulse to a 5 volt level pulse, and provides the means to disable the pulse during record mode.

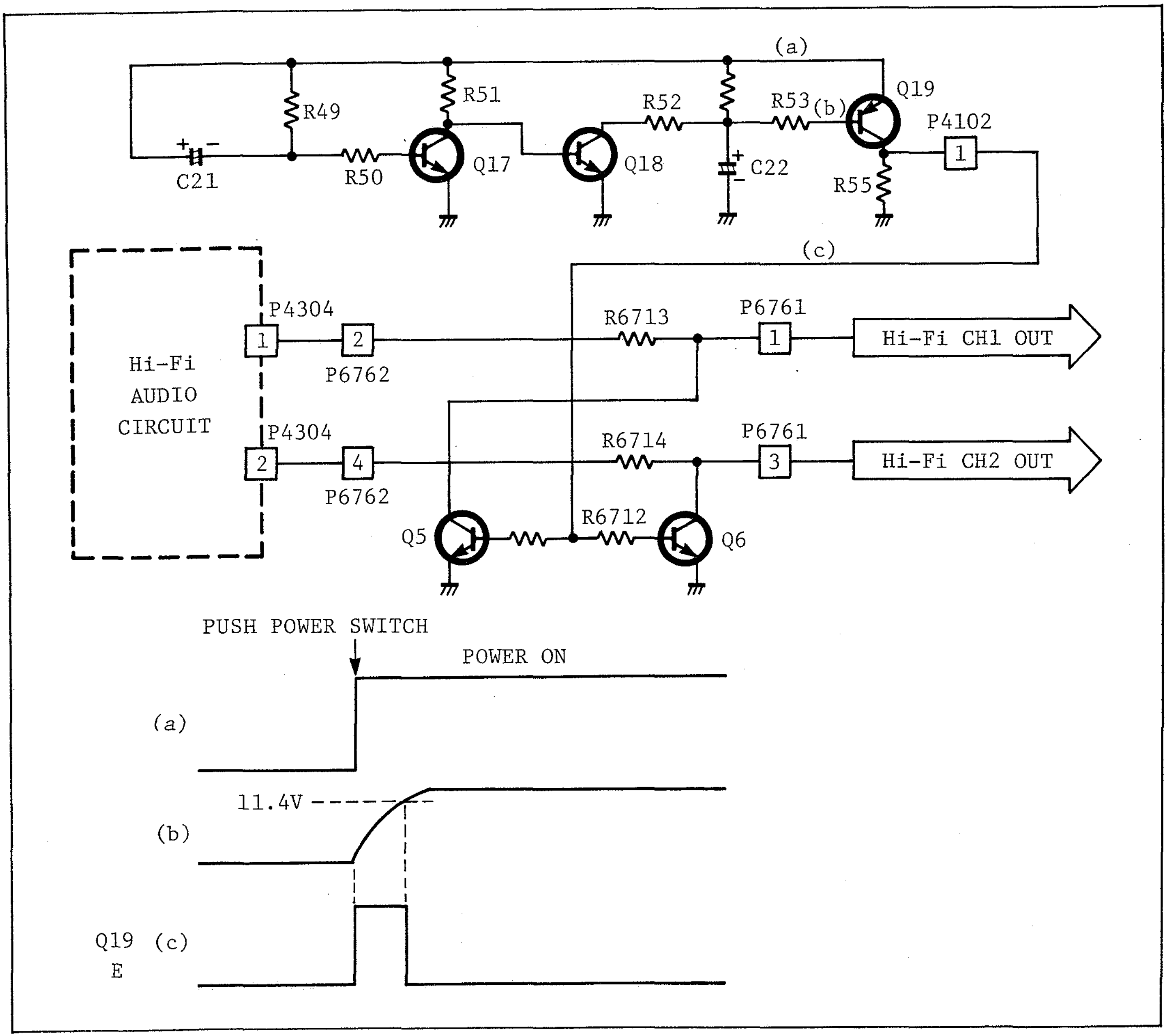

(a)
R49
R51
R52
R53
(b)
Q19
P4102
1
C21
R50
Q17
Q18
C22
R55
(c)
P4304
1
2
P6762
Hi-Fi
AUDIO
CIRCUIT
R6713
P6761
1
Hi-Fi CH1 OUT
P4304
2
4
P6762
R6714
P6761
3
Hi-Fi CH2 OUT
R6712
Q5
Q6
PUSH POWER SWITCH
POWER ON
(a)
11.4V
(b)
Q19 (c)
E

Figure 8-8. Pop Noise Elimination Circuit (During Power ON/OFF Switching).

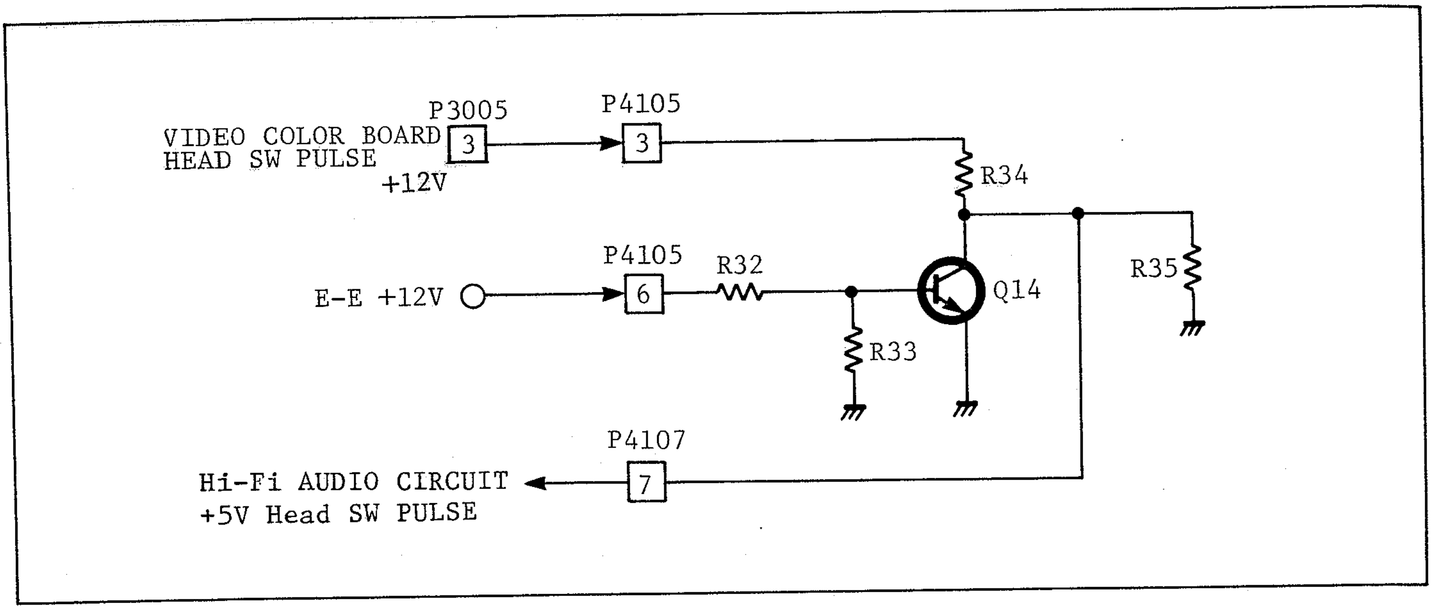

P3005
P4105
VIDEO COLOR BOARD
HEAD SW PULSE
3
3
+12V
R34
P4105
R32
E-E +12V
6
Q14
R35
R33
P4107
Hi-Fi AUDIO CIRCUIT
+5V Head SW PULSE
7

Figure 8-9. Head Switching Circuit

The Head Switching pulse from the Video Control board is applied to the voltage divider R34 and R35 so that a +5 volt pulse is sent out on P4107, pin 7. (This pulse is then processed at the Hi-Fi Audio board to produce the 120 degree advanced head switching pulse.) During Record mode, the EE +12 volt high signal turns Q14 on which grounds the head switching pulse signal to inhibit the pulse in record mode.

4. MUTING Hi-Fi AUDIO IN THE SEARCH MODE
When search mode is selected (from Remote Control AG-A600), the audio signal must be switched from Hi-Fi Audio to Normal Audio. Transistor stage Q15 (Figure 8-10) performs this function.
During search mode, the positive pulse train waveform shown is supplied at P4105 pin 9. The pulse train is integrated by C18, and the developed low level positive DC voltage is applied at the base of Q15.
As a result, Q15 turns on and a low signal is sent to the Hi-Fi Audio circuit where it is used to mute the Hi-Fi Audio and enable the Normal Audio.

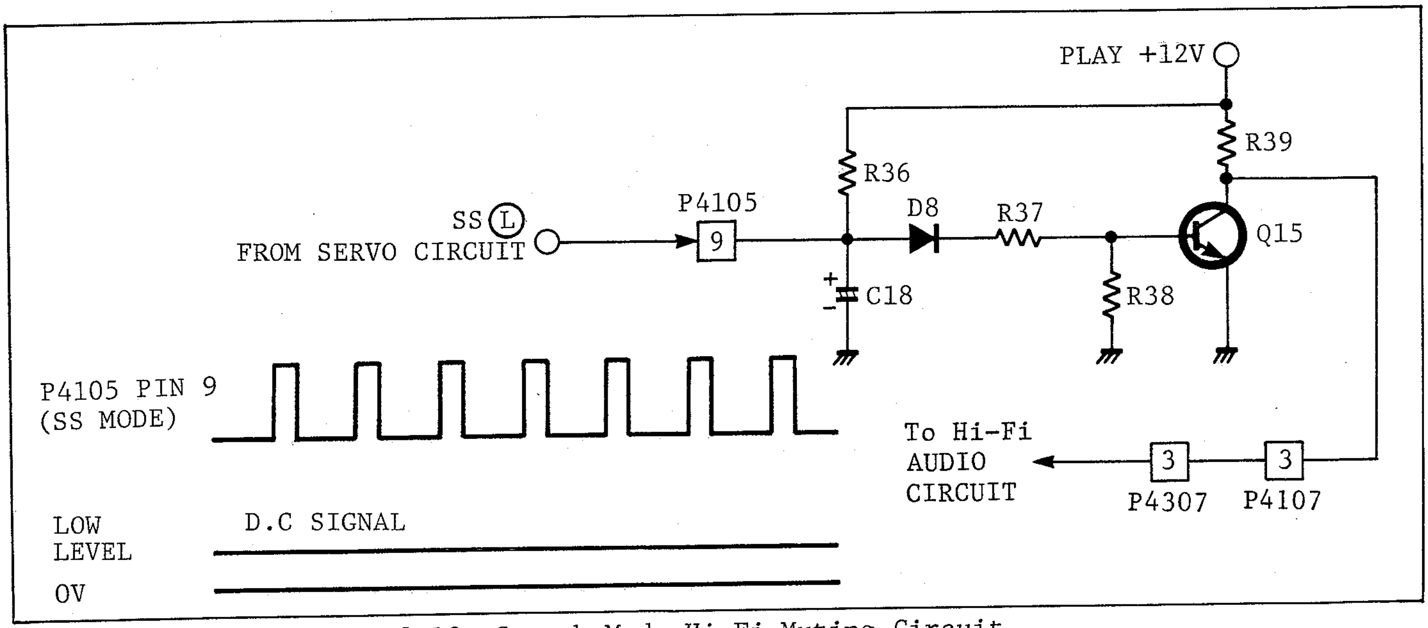

PLAY +12V
R39
R36
SS Ⓛ
FROM SERVO CIRCUIT
P4105
9
D8
R37
Q15
C18
R38
P4105 PIN 9
(SS MODE)
To Hi-Fi
AUDIO
CIRCUIT
3
3
P4307
P4107
LOW
LEVEL
D.C SIGNAL
OV

Figure 8-10. Search Mode Hi-Fi Muting Circuit.

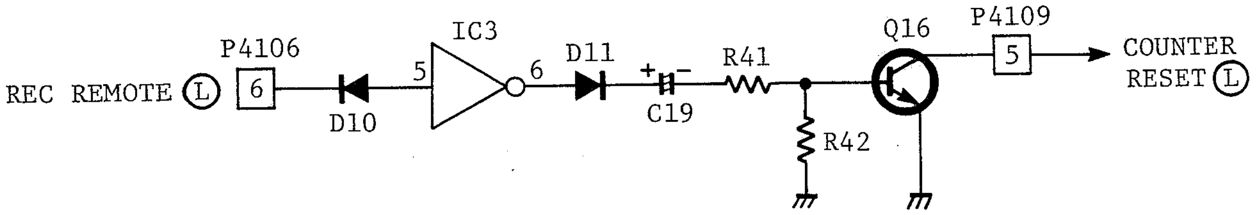

REC REMOTE (L)
P4106
6
D10
5
IC3
6
D11
+
C19
R41
R42
Q16
P4109
5
COUNTER
RESET (L)

Figure 8-11. Counter Reset Circuit.

5. COUNTER RESET CIRCUIT

This circuit (Figure 8-11) performs remote reset of the tape counter. When the REC/PLAY mode is selected using the REC REMOTE CONTROL switch. When the REC REMOTE CONTROL switch in ON, REC REMOTE Low signal is applied to IC3 inverter and results in an inverted high signal to Q16 base then ON transistor Q16 supplies Counter Reset Low at P4104 pin 5.

6. LED INDICATOR CIRCUITS

Hi-Fi (HD) INDICATOR CIRCUIT IN THE REC AND STOP MODES

Figure 8-12 shows the switching circuits which control the Hi-Fi or HD lamp (High Dynamic range audio indicator). In this mode, the HD lamp will turn ON when the AUDIO REC switch is set to the HD position. When the HD position is selected during either record or stop modes, EE +12V at P4106 pin 3 applied a high signal to the base of Q8. As a result, HD lamp is lighted through ON transistor Q8.

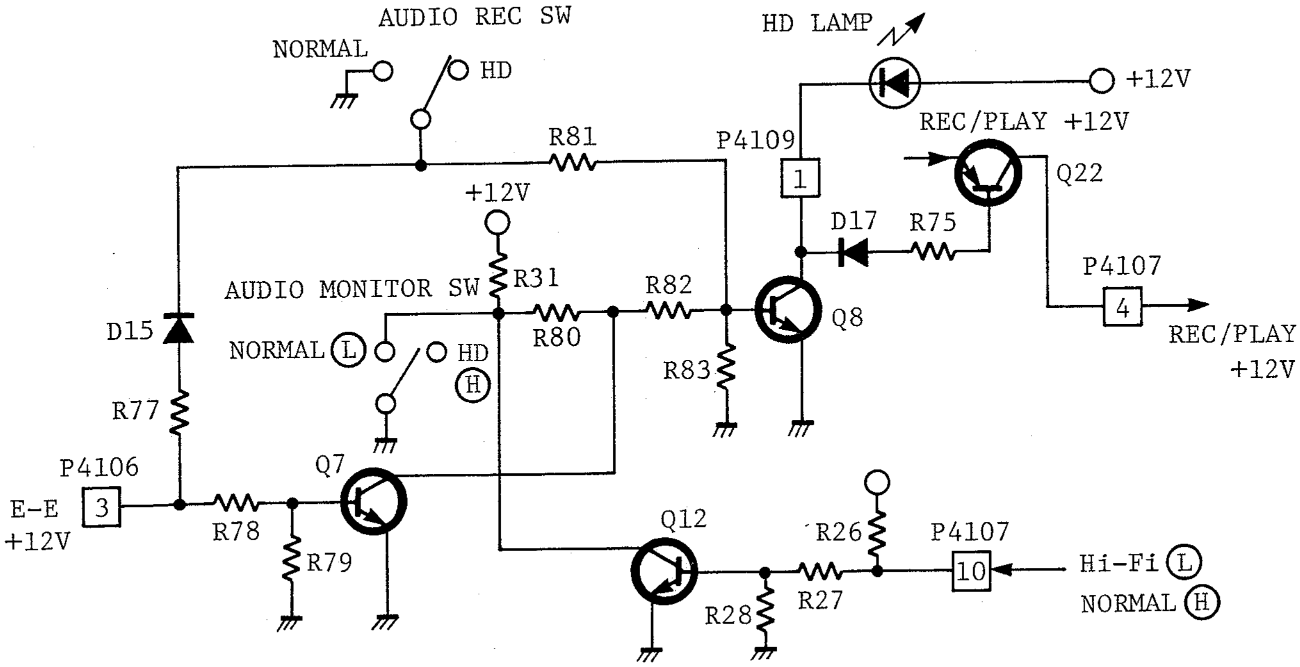

AUDIO REC SW
NORMAL
HD
R81
HD LAMP
+12V
P4109
1
REC/PLAY +12V
Q22
D17
R75
+12V
R31
AUDIO MONITOR SW
R82
R80
NORMAL (L)
HD (H)
Q8
P4107
4
REC/PLAY
+12V
D15
R83
R77
P4106
E-E
+12V
3
R78
R79
Q7
Q12
R26
P4107
10
Hi-Fi (L)
NORMAL (H)
R27
R28

Figure 8-12. Hi-Fi LED Indicator Circuit.

In addition, Q8 also turns ON Q22 and REC/PLAY +12V signal is sent to the Hi-Fi Audio circuit through P4107, pin 4.

Note that the position of the AUDIO MONITOR switch has no effect in record mode because the EE +12V signal applied to the base of Q7 turns on Q7, and effectively grounds the R80/R82 junction.

When the AUDIO REC switch is set to the NORMAL position, ground is applied at the base of Q8 which turns off, and the HD lamp goes off. Also, when Q8 turns off, Q22 turns off and the REC/PLAY +12V signal is removed from output at P4107 pin 4.

HD LAMP CIRCUIT IN THE PLAYBACK MODE

HD lamp turns ON in the playback mode when HD Mode is selected on the AUDIO MONITOR switch.

When the AUDIO MONITOR switch is set to the HD position, Q8 turns ON and the HD lamp goes ON. (Q7 is OFF because the EE +12 volts signal is not high in playback mode.

However if Hi-Fi audio signal was not recorded on the tape, NORMAL High signal appears at P4107 pin 10 and is applied to Q12 base. Q12 turns ON and turns OFF Q8. Therefore, HD lamp turns OFF for normal tape recording condition.

When the AUDIO MONITOR switch is set to the NORMAL position, the junction of R31, R80 is grounded so that Q8 turns OFF, and the HD lamp goes OFF.

REC ERROR LAMP CIRCUIT

While the record mode is selected from the REC REMOTE, the REC ERROR lamp flashes when the following error occurs:

1. When the unit detects that the cassette tape doesn't have a safety TAB.
2. When the AUTO OFF lamp is ON.
3. When the unit detects the translucent portion of the tape at the start point or during recording.

Figure 8-13 shows the REC ERROR LAMP circuit, and figure 8-14 gives the circuit waveforms.

When the record mode is selected from the remote control, the REC REMOTE signal (a) at P4106 pin 6 goes low and the IC3 inverter output (b) goes high.

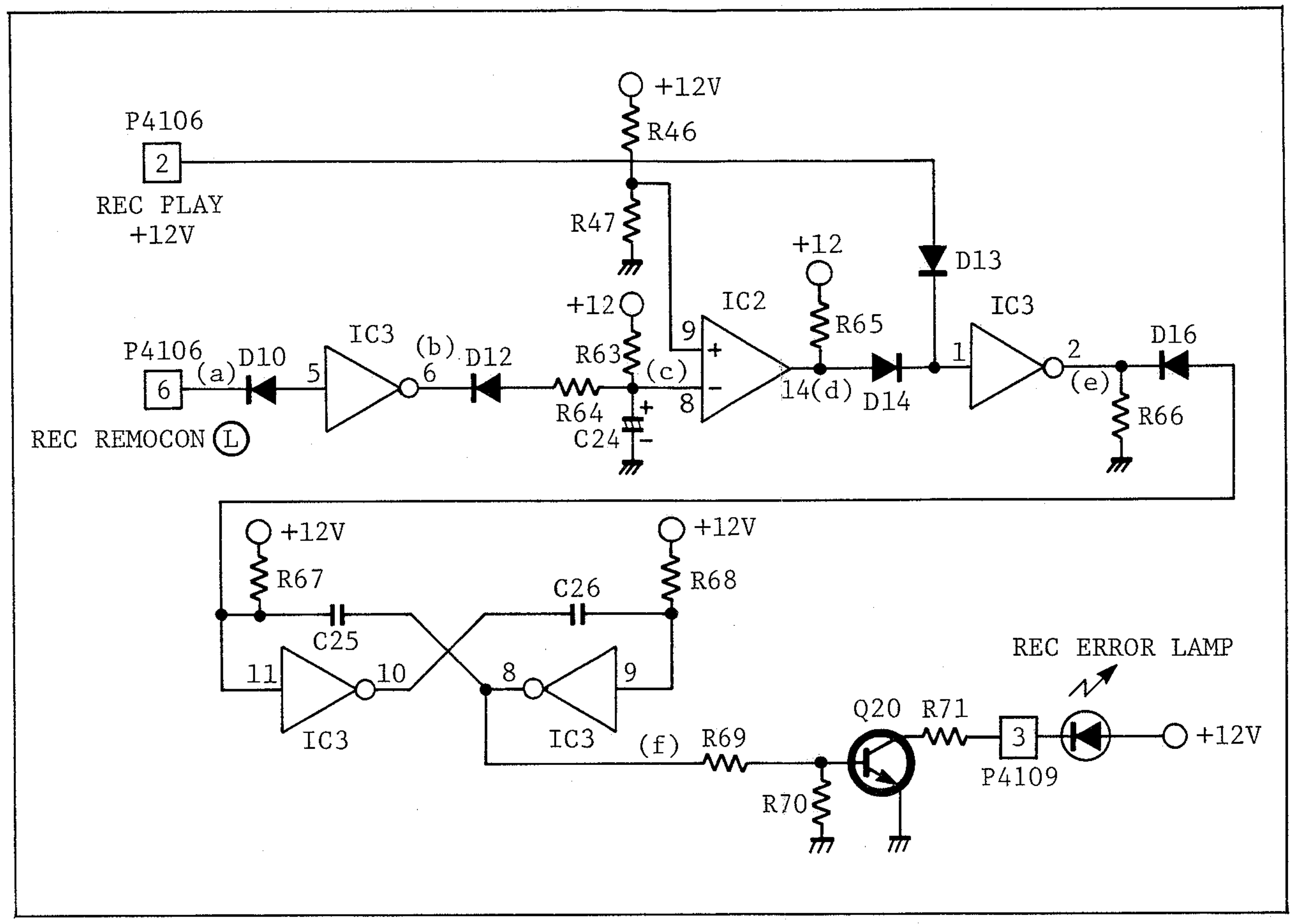


Figure 8-13. REC Error Lamp Circuit.

The positive going edge of (b) is integrated by C24 producing waveform (c) at the IC2 comparator input. When this reaches the reference voltage at pin 9 of the comparator, the output at pin 14 (d) goes low and is applied to a second invertor in IC3. The inverted waveform (e) enables the astable multivibrator which produces the pulse waveform (f).

This operates Q20 ON and OFF, and results in a flashing REC ERROR indication.

During normal (non-error) record mode, R/P +12V is supplied at P4106 pin 2 and is applied as a second input to pin 1 of inverter IC3. This overides the low of waveform (d), and the output at pin 3 stays low.

Therefore, the astable multivibrator is not enabled and the REC ERROR lamp remains off.

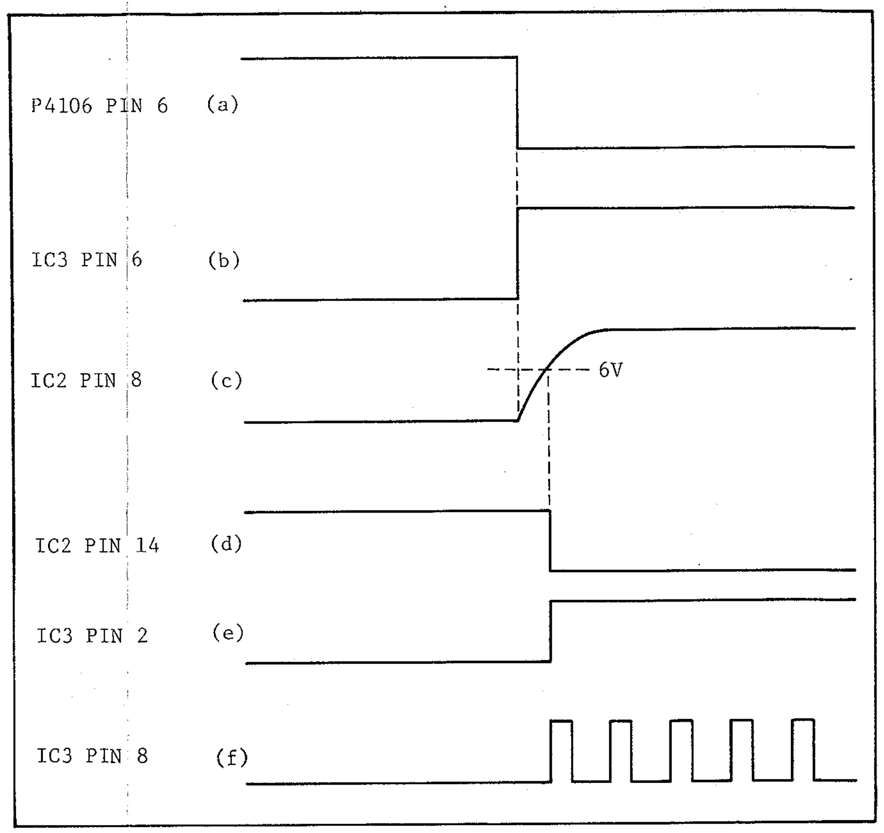


Figure 8-14. REC Error Lamp Circuit Waveforms.

MODE LOCK LAMP LED

When the mode lock switch is set to the ON position, a high signal is applied to Q11 base through R23, R24, R25.

This turns on Q11 and the MODE LOCK lamp is turned ON by the ground supplied through P4109 pin 2.

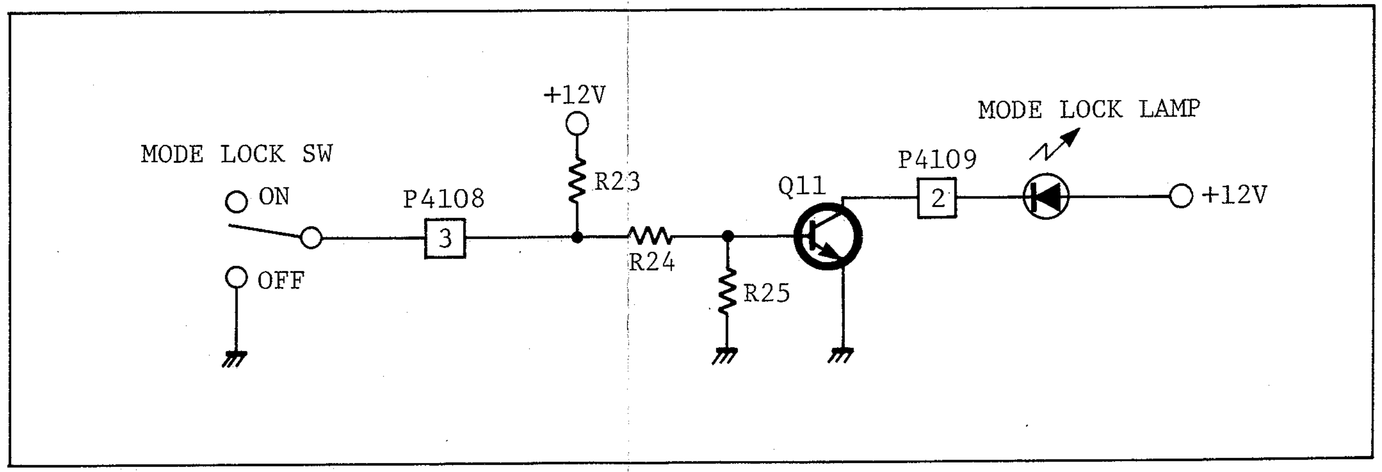


Figure 8-15. Mode Lock Lamp Circuit.

7. AUDIO METER CIRCUIT

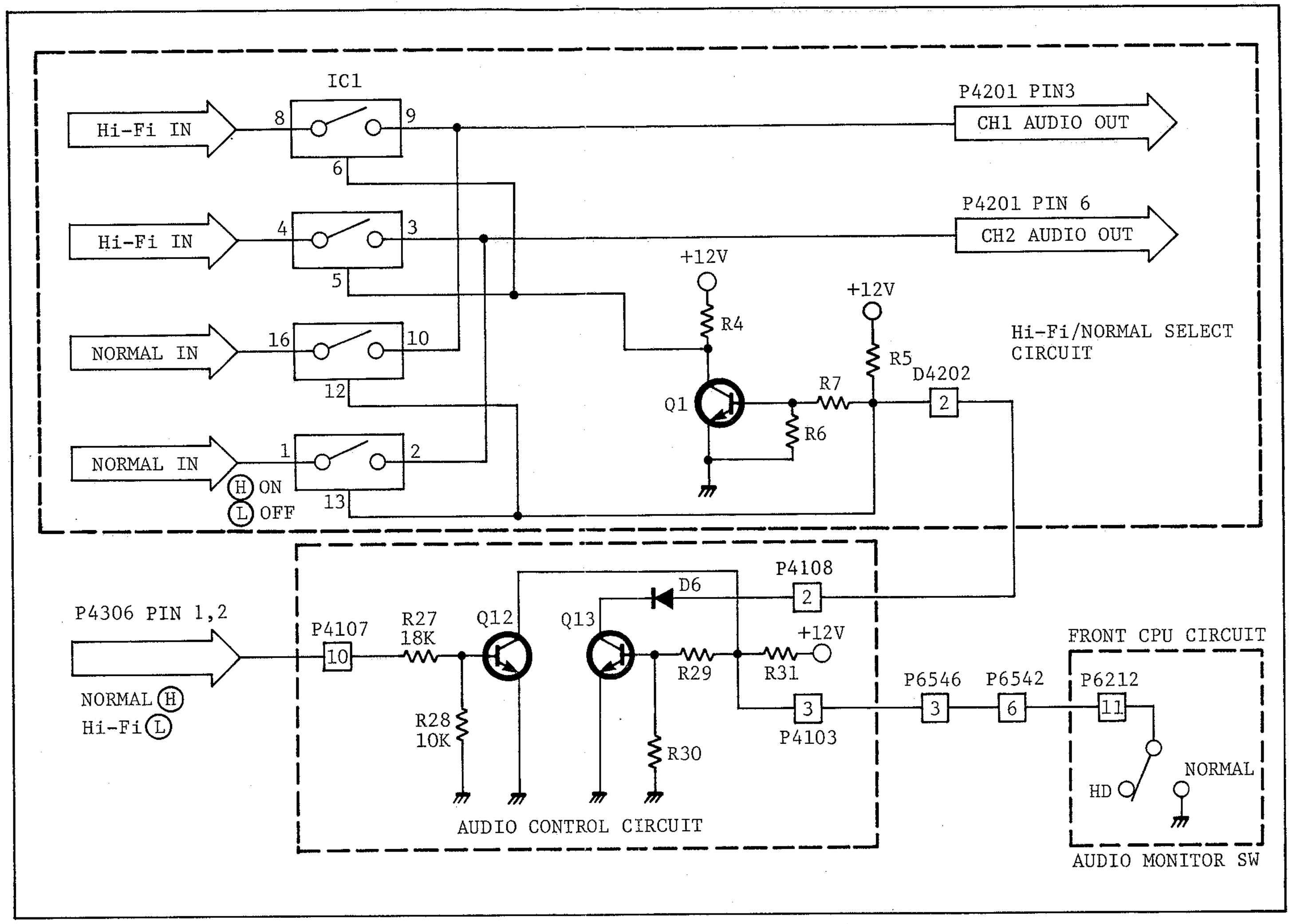
The audio meter circuit shown in figure 8-16 is used either during record or playback, and consists of identical circuitry for each of the two channels. Since the two channels are the same, the description will apply to either channel but only channel 1 components will be identified.

The input audio is selected by the AUDIO METER SWITCH on the Left Control Panel so that either Hi-Fi or NORMAL audio is supplied to IC4 pin 4 through P4101 pin 1.

The selected audio is logarithmically compressed by IC4 and then applied to IC1 pin 10. IC1 and Q1 together with D1 and R2, R3, R4, C3 form an audio detector. The detected output at IC1 pin 7 is sent to the meter + side through P4103 pin 1. The meter - side is then sent back through P4103 pin 2 to the return circuit through Q3, Q4.

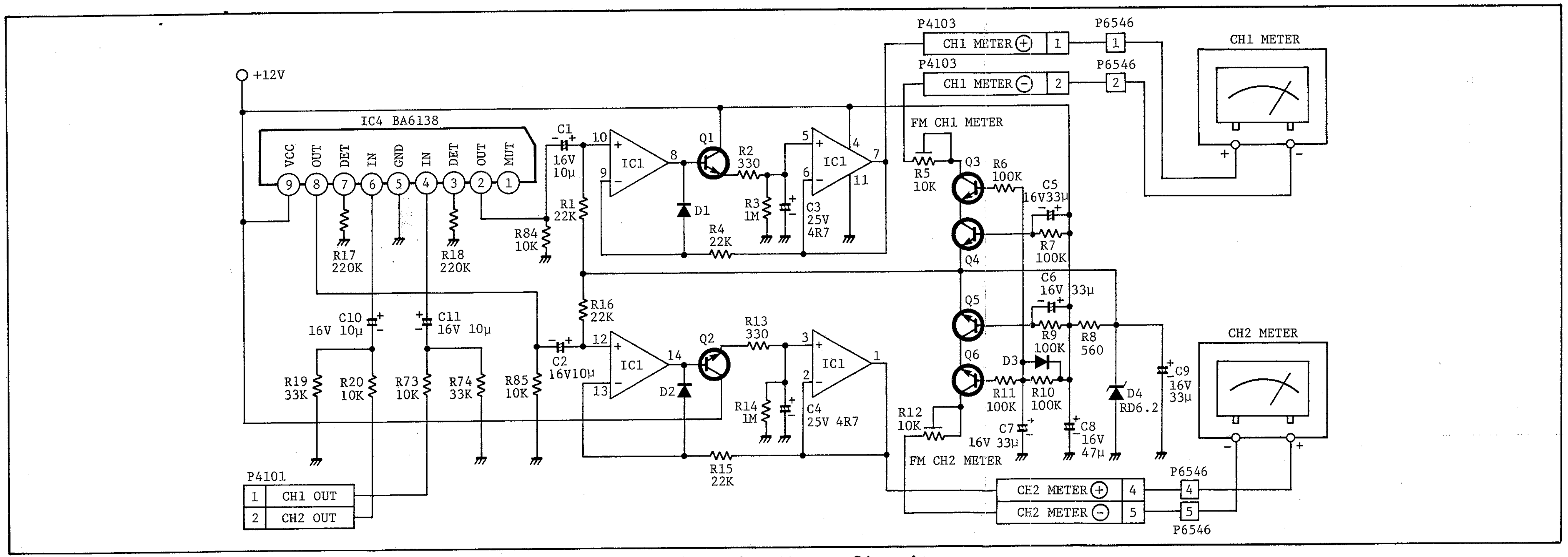
Note that the meter return "ground" at the Q4 emitter is actually +6 volts developed by D4 and C9.

Note also that the input to the base of Q4 is applied through R7, C5. This provides a smoothing action so that the meter will deflect slowly when power is applied.



IC1
Hi-Fi IN
Hi-Fi IN
NORMAL IN
NORMAL IN
8
9
6
4
3
5
16
10
12
1
2
13
Ⓗ ON
Ⓛ OFF
P4201 PIN3
CH1 AUDIO OUT
P4201 PIN 6
CH2 AUDIO OUT
+12V
R4
+12V
R5
D4202
2
R7
R6
Q1
Hi-Fi/NORMAL SELECT CIRCUIT
P4306 PIN 1,2
NORMAL Ⓗ
Hi-Fi Ⓛ
P4107
10
R27 18K
Q12
Q13
D6
P4108
2
+12V
R29
R31
3
P4103
R28 10K
R30
AUDIO CONTROL CIRCUIT
P6546
3
P6542
6
FRONT CPU CIRCUIT
P6212
11
NORMAL
HD
AUDIO MONITOR SW

Figure 8-17. Hi-Fi/Normal Select Círcuit.



+12V
IC4 BA6138
VCC
OUT
DET
IN
GND
IN
DET
OUT
MUT
9
8
7
6
5
4
3
2
1
R17 220K
R18 220K
C10 16V 10µ
C11 16V 10µ
R19 33K
R20 10K
R73 10K
R74 33K
R85 10K
P4101
1 CH1 OUT
2 CH2 OUT
C1 16V 10µ
R1 22K
R84 10K
R16 22K
C2 16V10µ
IC1
Q1
D1
R2 330
R3 1M
R4 22K
C3 25V 4R7
IC1
Q2
D2
R13 330
R14 1M
R15 22K
C4 25V 4R7
P4103
CH1 METER ⊕ 1
P4103
CH1 METER ⊖ 2
P6546
1
P6546
2
CH1 METER
FM CH1 METER
R5 10K
Q3
R6 100K
C5 16V33µ
R7 100K
Q4
C6 16V 33µ
R9 100K
R8 560
Q5
Q6
D3
R11 100K
R10 100K
D4 RD6.2
C9 16V 33µ
C7 16V 33µ
C8 16V 47µ
R12 10K
FM CH2 METER
CH2 METER
CH2 METER ⊕ 4
CH2 METER ⊖ 5
P6546
4
5
P6546

Figure 8-16. Audio Meter Circuit.

8. Hi-Fi/NORMAL SELECT CIRCUIT

Hi-Fi and NORMAL audio signals are automatically switched by this circuit which includes the IC switch in the FM/LINEAR SELECT board and the AUDIO MONITOR SWITCH on the Front CPU board.

A. Automatic Normal Audio Selection Process

If the audio carrier signals are of very low amplitude, a high appears at P4306 pins 1 and 2 from the Hi-Fi Audio Circuit. The high is applied to the base of Q12 on the Audio Control Circuit board, turning on Q12, and the Q12 low collector turns off Q13. When Q13 goes off, Q1 turns on by the +12V from R5, R7. The low Q1 collector therefore turns off the upper IC1 switches which disconnects the Hi-Fi audio from the output.

At the same time, the high of P4202 pin 2 turns on the lower IC1 switches and connects the normal audio to the output.

B. Automatic Hi-Fi Audio Selection Process

When the incoming audio carrier signals are of sufficient amplitude for Hi-Fi operation, a low appears at P4306 pins 1 and 2. In this mode, Q13 will be turned on, and the low collector of Q13 will be coupled through D6 and P4108 pin 2 to P4202 pin 2. As a result, the normal audio IC1 switches are turned off and the Hi-Fi audio IC1 switches are turned on.

C. Manual NORMAL AUDIO Selection Using AUDIO MONITOR SWITCH

When the AUDIO MONITOR SWITCH is set to the NORMAL position, ground is directly applied to the base of Q13. This overides any high from Q12 and keeps the system in normal audio mode regardless of the input at P4306 pins 1 and 2. When the AUDIO MONITOR SWITCH is set to the HD position, the switch has no effect upon the input at the base of Q13. Therefore, audio mode selection is determined by the input at P4306 pins 1 and 2 as in A. and B. above.

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ORDER NO. VRD-8310-493

Service Manual

Video Cassette Recorder

Vol. 2

Panasonic
Omnivision II VHS Hi-Fi

AG-6800

Mechanical Adjustment Procedures

Electrical Adjustment Procedures

SPECIFICATIONS

Power Source; 110/120/220/240 V AC, 60/50 Hz
Power Consumption: Approx. 60 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads, helical scanning system
Luminance: FM azimuth recording
Color signal: converted subcarrier phase shift recording
Audio Tracks: 4 channels
NORMAL (CH1/CH2): 2 fixed head tracks
HD (CH1/CH2): 2 rotary head tracks
Tape Format: Tape width 1/2 inch (12.7 mm), high density tape
Tape Speed: 1-5/16 i.p.s. (33.35 mm/s) (Normal)
Record/Playback Time: 120 min. with NV-T120
FF/REW Time: Less than 4.0 min with NV-T120
Input Level: Video: VIDEO IN (BNC), 1.0 Vp-p, 75 Ω
Audio: LINE IN (RCA);
NORMAL (CH1/CH2) −20 dB (standard input −8 dB), 47 kΩ
HD (CH1/CH2)
Output Level: Video: TV Monitor (8 pins), 1.0 Vp-p, 75 Ω
VIDEO OUT (BNC), 1.0 Vp-p, 75 Ω
Audio: TV Monitor (8 pins), 0 dB, 600 Ω
AUDIO OUT (RCA);
NORMAL (CH1/CH2) −8 dB, 1 kΩ
HD (CH1/CH2)
HEADPHONES,
−16 dB ~ −60 dB, 8 Ω

Rec Remote: (RCA)
Camera Remote: (M2)
Video Horizontal Resolution: Color: more than 240 lines
B/W: more than 300 lines
(on monoscope test pattern)
Audio Frequency Response: 50 ~ 12,000 Hz (Normal Audio)
20 ~ 20,000 Hz (HD Sound)
Signal-to-Noise Ratio: Video: B/W: better than 46 dB
Color: better than 45 dB
(Shibasoku noise meter)
Audio: better than 48 dB (Normal Audio/ Dolby NR IN)
Audio Dynamic Range: better than 80 dB (HD Sound)
Wow and Flutter: less than 0.005% (HD Sound)
Operating Temperature: 41°F ~ 104°F (5°C ~ 40°C)
Operating Humidity: 35% ~ 80%
Weight: 30.9 lbs (14.0 kg)
Dimensions: 17″(W) × 15-1/2″(D) × 6-1/4″(H)
430(W) × 392(D) × 158(H) mm
Accessory Supplied: 1 pc. Dust cover

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

* Noise reduction manufactured under license from Dolby Laboratories Licencing Corporation.

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IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are shaded on the schematic diagram. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire, or other hazards.
Do not modify the original design without permission of manufacturer.

SAFETY PRECAUTIONS

GENERAL GUIDELINES

1. When servicing, observe the original lead dress. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
2. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers shileds are properly installed.
3. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

LEAKAGE CURRENT COLD CHECK

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Measure the resistance value, with an ohmmeter, between the jumpered AC plug and each exposed metallic cabinet part on the equipment such as screwheads, connectors, control shafts, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 MΩ and 5.2 MΩ.
   When the exposed metal does not have a return path to the chassis, the reading must be ∞.

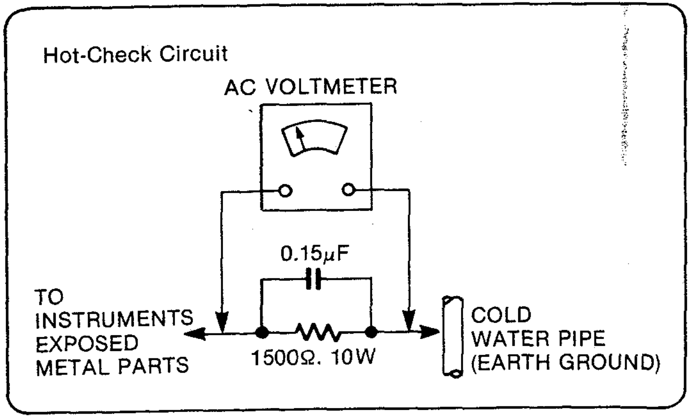
Hot-Check Circuit
AC VOLTMETER
0.15μF
TO INSTRUMENTS EXPOSED METAL PARTS
1500Ω. 10W
COLD WATER PIPE (EARTH GROUND)

Figure 1

LEAKAGE CURRENT HOT CHECK (See figure 1.)

1. Plug the AC cord directly into the AC outlet. Do not use an isolation transformer for this check.
2. Connect a 1.5kΩ, 10 watts resistor, in parallel with a 0.15μF capacitor, between each exposed metallic part on the set and a good earth ground such as a water pipe, as shown in figure 1.
3. Use an AC voltmeter, with 1000 ohms/volt or more sensitivity, to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the AC plug in the AC outlet and repeat each of the above measurements.
6. The potential at any point should not exceed 0.75 volts RMS. A leakage current tester (Simpson Model 229 equivalent) may be used to make the hot checks, leakage current must not exceed 1/2 milliamp. In case a measurement is outside of the limits specified, there is a possibility of a shock hazard, and the equipment should be repaired and rechecked before it is returned to the customer.

AG-6800 Mechanical Maintenance Chart

We recommend that the following periodic checks be performed to prolong the life of the machine.
Since the parts are keyed to the Inner parts Location Diagram. When you replace the following parts, refer to the diagram.

◎ Replacement
● Cleaning
△ Lobrication

	Parts Name & Ass'y No.	HOUR									
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000
1.	Upper Cylinder Unit (VEH0227)	●	◎	●	◎	●	◎	●	◎	●	◎
2.	Cylinder Unit (VEG0315)	●	●	●	●	●	●	●	●	●	●
3.	A/C Head (VBR0069)	●	●	●	●	●	●	●	◎	●	●
4.	Erase Head Unit (VBS0024)	●	●	●	●	●	●	●	◎	●	●
5.	Capstan Shaft	●	●	●	●	●	●	●	●	●	●
6.	Pressure Roller (VXL1034)	●	●	●	●	●	●	●	◎	●	●
7.	Reel Motor (KFN56FB8A)				◎				◎		
8.	Kick Pulley Belt (VDV0138)				◎				◎		
9.	Supply Reel Table (VXR0109)				△				△		
10.	Take-up Reel Table (VXR0117)				△				△		
11.	Loading Motor Unit (VEM0135)								◎		
12.	Front Loading Motor (MXN12AE10C)								◎		
13.	Loading Belt (1) (VDV0122)				◎				◎		
14.	Loading Belt (2) (VDV0135)				◎				◎		
15.	Front Loading Belt (VDV0144)				◎				◎		
16.	Slip Brush (VXS0055)				◎				◎		
17.	Capstan Motor Unit (VEM0164)		△		△		△		△		△
18.	Tape Transporters	●	●	●	●	●	●	●	●	●	●
19.	Fan Motor (EBP06B24L)	Replace every 10000 Hours									

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MECHANICAL ADJUSTMENT PROCEDURES

1. DISASSEMBLY OF CABINET PARTS

1-1. DISASSEMBLY FLOWCHART (Figure D1)

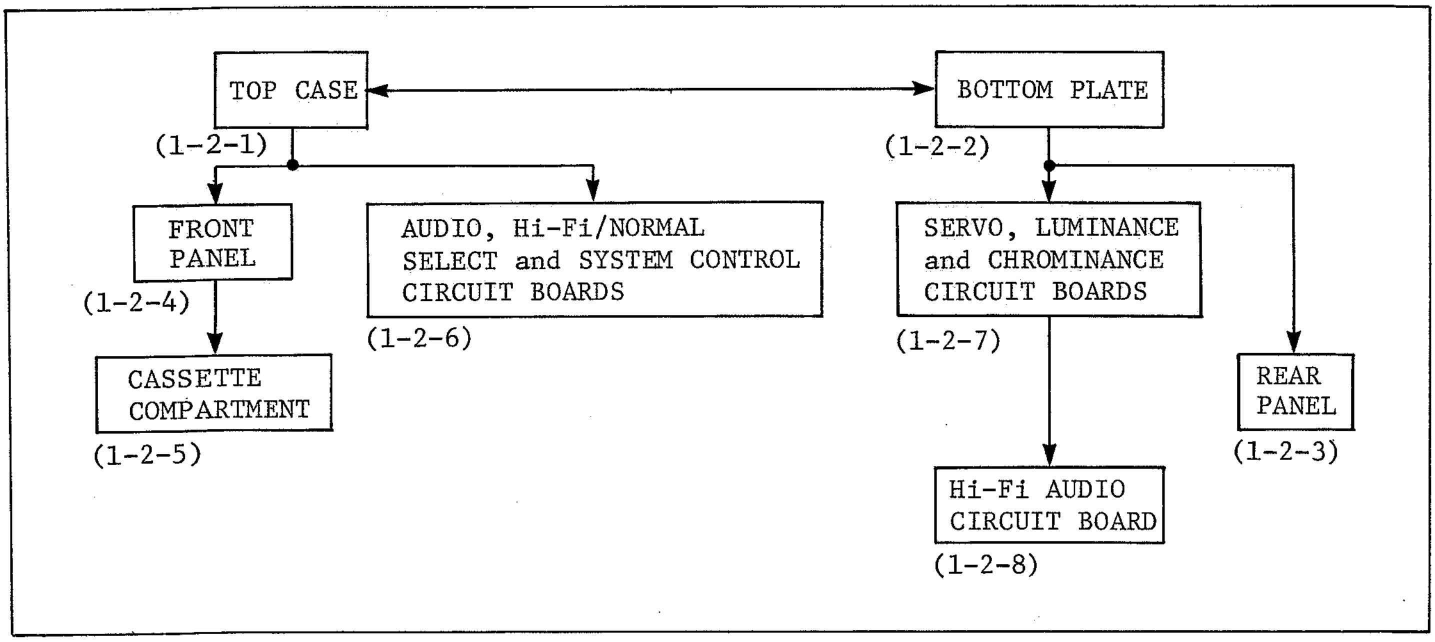

TOP CASE
(1-2-1)
BOTTOM PLATE
(1-2-2)
FRONT PANEL
(1-2-4)
AUDIO, Hi-Fi/NORMAL SELECT and SYSTEM CONTROL CIRCUIT BOARDS
(1-2-6)
SERVO, LUMINANCE and CHROMINANCE CIRCUIT BOARDS
(1-2-7)
CASSETTE COMPARTMENT
(1-2-5)
REAR PANEL
(1-2-3)
Hi-Fi AUDIO CIRCUIT BOARD
(1-2-8)

Figure D1

This flow chart describes the order of steps for removing the cabinet parts and certain printed circuit boards in order to gain access to the items needing servicing. To reassemble the unit, follow the steps in reverse order.

1-2. DETAILED DISASSEMBLY METHOD

1-2-1. Removal of the Top Case

1. Unscrew the 4 screws (A) in the side panel of the Top Case. (Figure D2)
2. Carefully lift the rear of the case and slide it off the back of the unit.

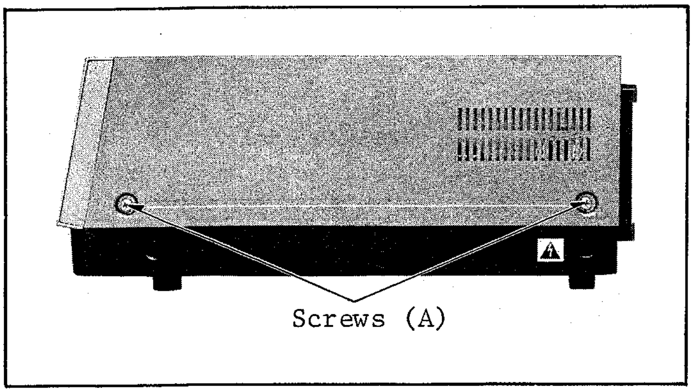


Figure D2

1-2-2. Removal of the Bottom Plate

1. Unscrew the 3 screws (B) with saw-tooth washer.
2. Unscrew the 4 screws (C) in the side panel of the Bottom plate.(Figure D3)
3. Lift off the Bottom Plate.

Note:
Do not remove the 4 rubber feet from the Bottom Plate.

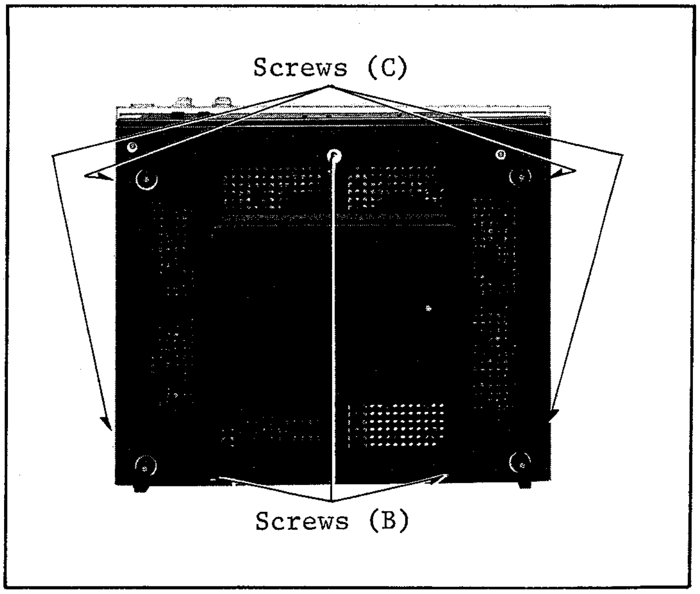

Screws (C)
Screws (B)

Figure D3

1-2-3. Removal of the Rear Panel

1. Unscrew the 4 screws (D) in the corners and the 2 screws (E) in the side of the Rear Panel.(Figure D4)
2. Lift the Rear Panel and carefully pull the panel off the unit.

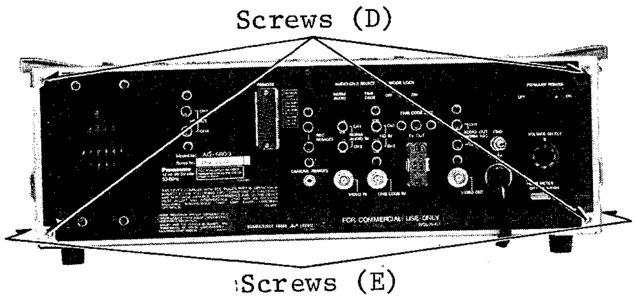


Figure D4

1-2-4. Removal of the Front Panel.

1. Unscrew the 2 screws (F) in the Top and the 2 screws (G) in the bottom of the Front Panel. (Figure D5)
2. Lift the Front Panel and carefully pull the panel off the unit.

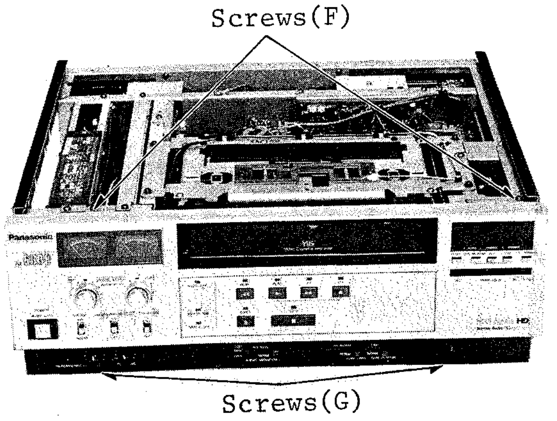


Figure D5

1-2-5. Removal of the cassette Compartment

1. Unscrew the 4 screws (H) from the Cassette Compartment. (Figure D6)
2. Carefully lift the Cassette Compartment out.

Note:
Do not disconnect the connectors P6751, P6752 and P6753.

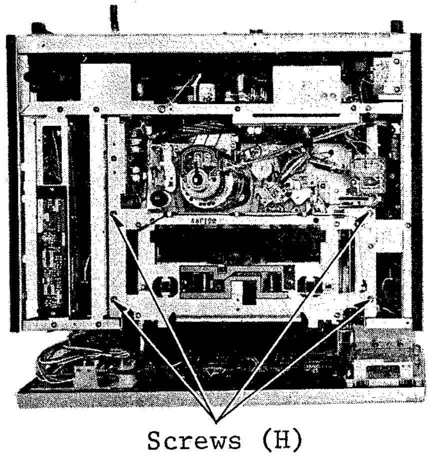


Figure D6

1-2-6. Opening of Side Circuit Boards (Audio Circuit Board, Hi-Fi/ Normal Select Circuit Board and System Control Circuit Board)

* Opening of the Audio Circuit Board and Hi-Fi/Normal Select Circuit Board (Figure D7)

1. Unscrew the 2 screws (J) of the left reinforcement and remove the left reinforcement.
2. Unscrew the 2 screws (K) from the unit and pull the circuit board out from the unit.

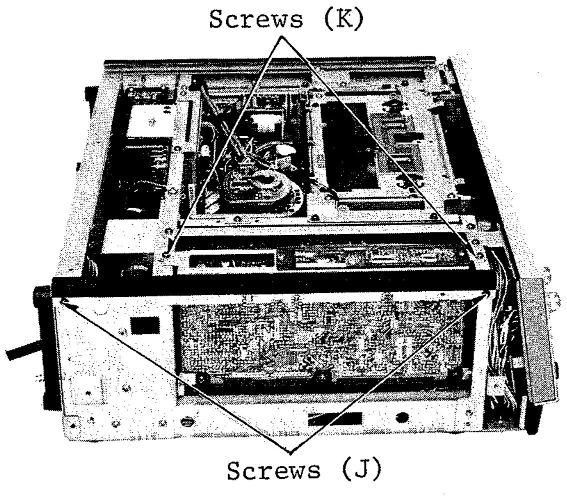


Figure D7

* Remove the System Control Circuit Board (Figure D8)

1. Unscrew the 2 screws (L) from the unit.
2. Lift the circuit board out from the unit.

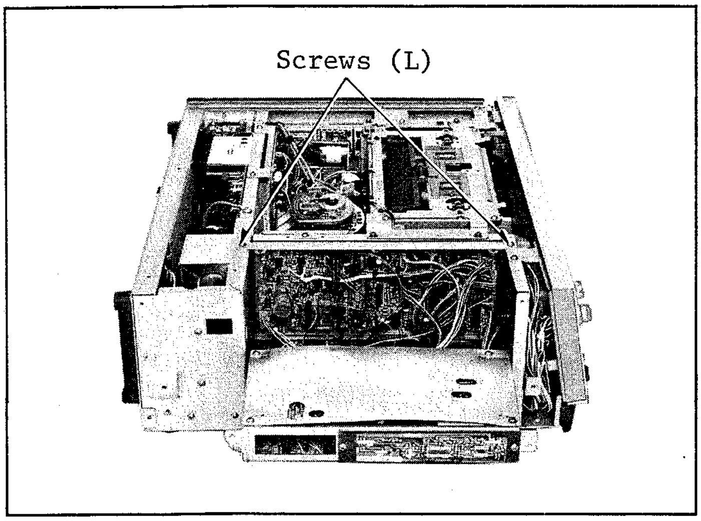


Figure D8

1-2-7. Opening of the Bottom Circuit Boards. (Servo circuit board and Luminance & Chrominance circuit board.)

1. Unscrew the 6 screws (M) from the Bottom Circuit Boards. (Figure D9)
2. Open up the Bottom Circuit Boards.

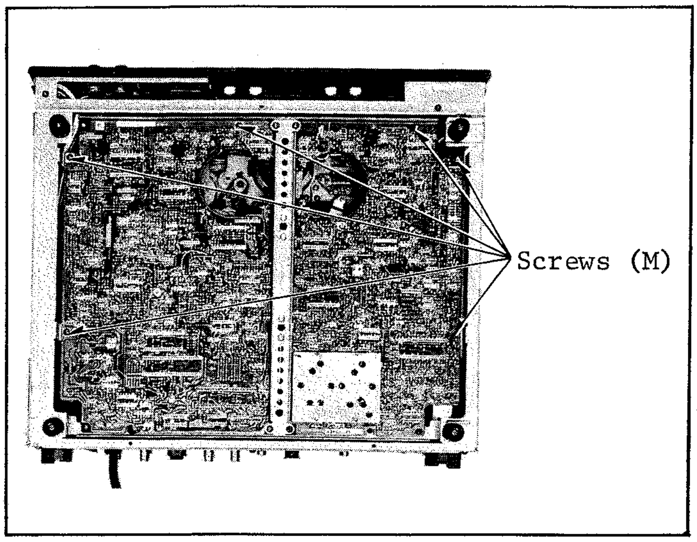


Figure D9

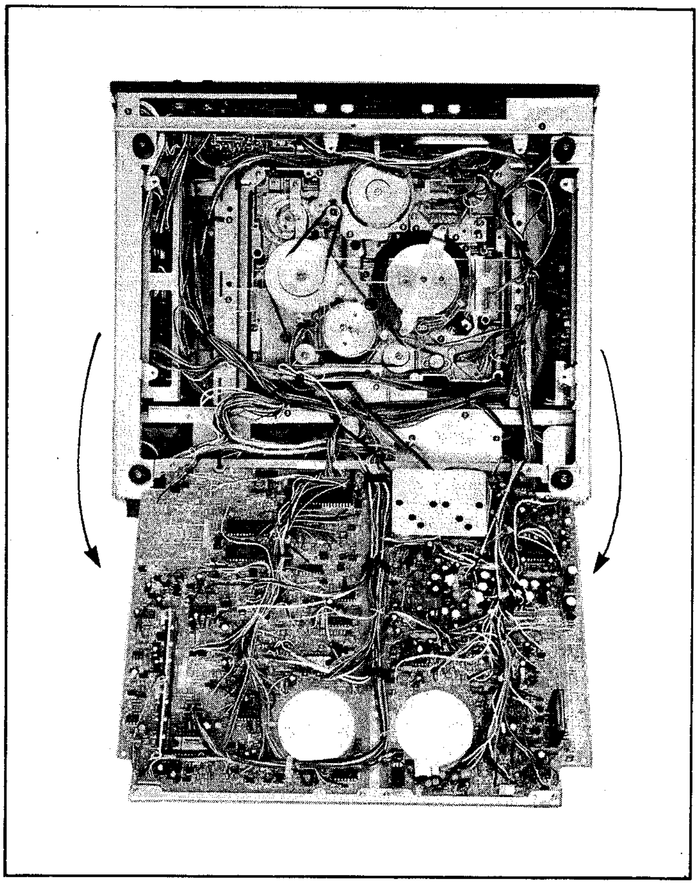


Figure D10

1-2-8. Remove the Hi-Fi Audio Circuit Board

1. Open up the Bottom Circuit Board.
2. Unscrew the 2 screws (N) from the side Panel. (Figure D11)
3. Pull the circuit board out from the unit. (Figure D12)

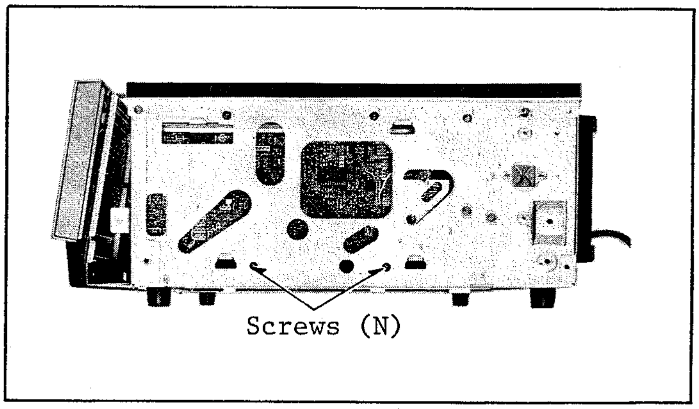


Figure D11

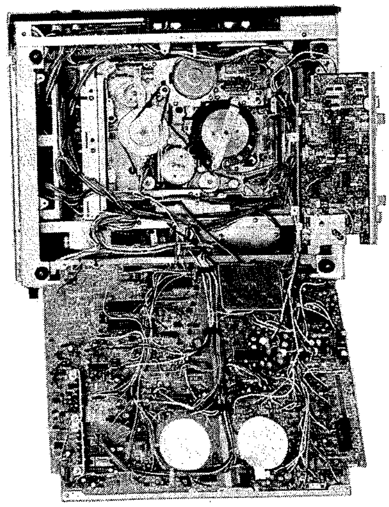


Figure D12

2. MECHANICAL MAINTENANCE PROCEDURES

2-1. REPLACEMENT PROCEDURES FOR STATOR ANGLE, RT ROTOR BASE AND UPPER CYLINDER

Removal Procedures:

1. Stator Angle

First, remove the connector (A) from the Stator Angle.
Next, unscrew the 2 screws (B) and then remove the Stator Angle as shown in Figure M1.

Note:

Be very careful to remove the Stator Angle so that it won't directly come into contact with lead wires alongside and the Video Head as well.
Never touch the Rotary Transformer and screw (C) that secure the Stator Base. If screws (C) are removed, the properly adjusted hight of the Stator Base will vary.

2. RT Rotor Base

First, unscrew the 2 screws (D), and then unsolder 4 of the soldered portion connecting the RT Rotor Base and the Upper Cylinder, and finally remove the RT Rotor Base.

3. Upper Cylinder

Unscrew the 2 screws (E) and unsolder 8 of the soldered portion indicated by arrows on the Upper Cylinder, and finally remove the video heads.

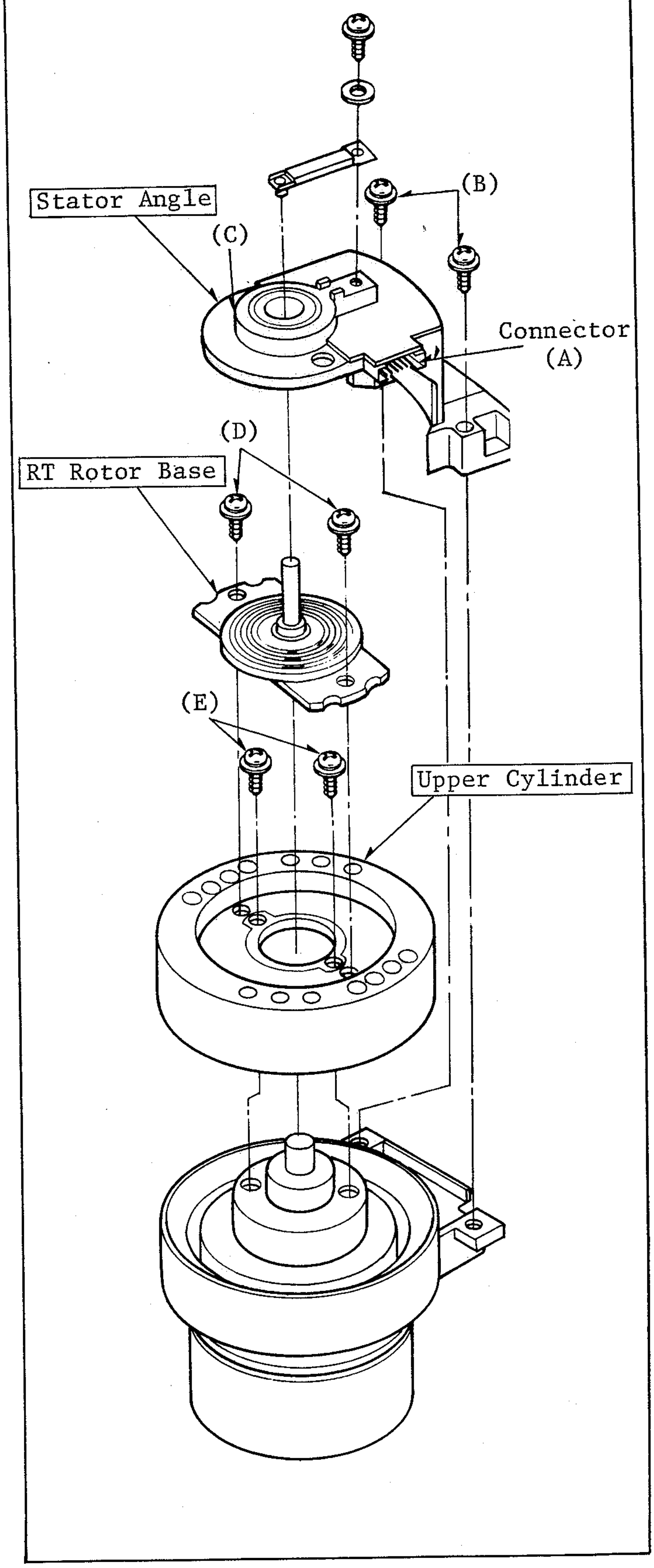


Figure M1

Reinstallation Procedures

1. Reverse the Removal Procedures for reinstalling the Upper Cylinder, and then RT Rotor Base.

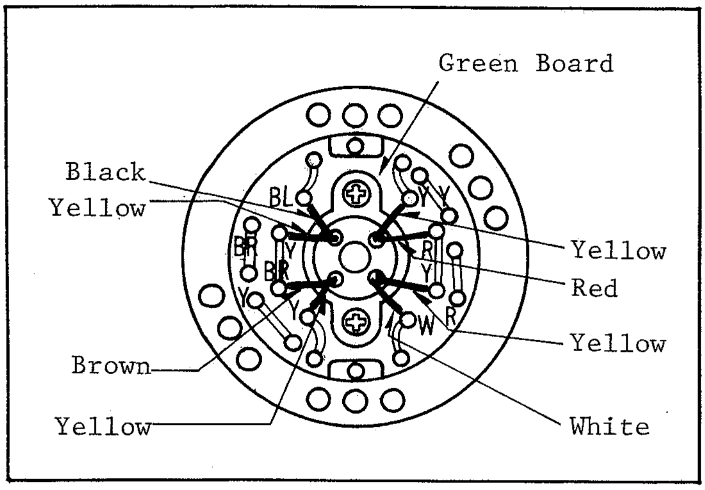


Figure M2

Note:
The color code of 8 leads match leads on the head relay board.

2. Before reinstalling the Stator Angle, as shown in Figure M2, carefully tighten screws (B) with the designated "Stator Angle Adjustment Jig (VFK0268)" After screws (B) are properly tightened, disengage this Jig.
3. Connect the connector (A).
4. Playback the pre-recorded tape, and check the playback picture.

STATOR ANGLE ADJUSTMENT JIG

To correctly reinstall the Stator Angle, the designated Stator Angle Jig (VFK0268) must be used.

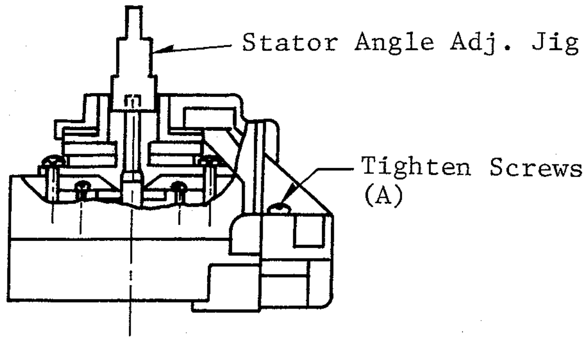


Figure M3

2-2. REPLACEMENT OF THE DD CYLINDER UNIT

Work with extreme care when removing or replacing the DD cylinder unit. Do not touch video heads during servicing.

1. Remove the Top Case, Cassette Compartment, Bottom Plate and open up the Bottom Circuit Boards.
   Refer to "DISASSEMBLY METHOD" section.
2. Disconnect the connector P001 and P3008 then unscrew the 3 screws (A). (Figure M4)
   Since there is very little clearance between DD Cylinder and Chassis, remove the Cylinder gently and carefully.

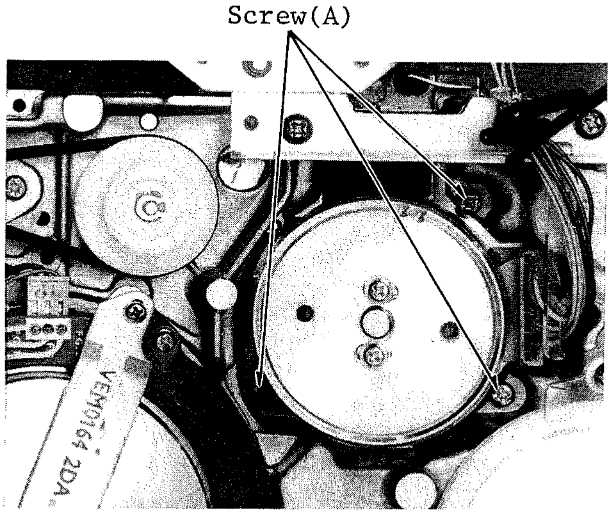


Figure M4

3. Reinstall the new DD Cylinder unit to the chassis and reconnect the connectors P001 and P3008.

Note:
Upon completion of replacement, confirm the performance.
And if any further maintenance is required, refer to the "TAPE INTERCHANGEABILITY ADJUSTMENT" section and perform the necessary items.

3. ADJUSTMENT PROCEDURES

3-1. ADJUSTMENT OF THE SAFETY SWITCH

* Specification
The switch should close when a cassette with an erase tab is inserted, and should open when a cassette without an erase tab is inserted.

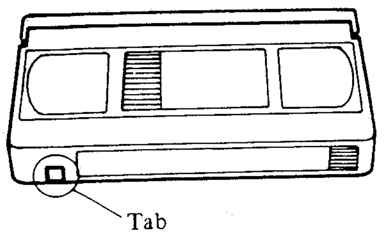


Figure M5

* Equipment Required:
Cassette Holder Fixture ... VFKS0004

1. Remove the Top Case, and cassette Compartment.
2. Place the fixture just slightly loosen 3 screws (A) by about half turn.
3. Turn the switch base counter clockwise and then slowly turn clockwise until the switch turn on.
4. Tighten 3 screws.

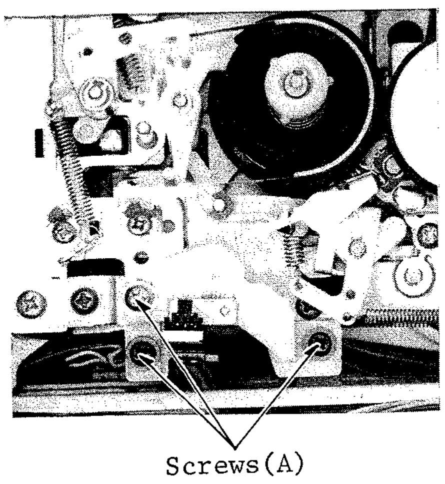


Figure M6

3-2. CONFIRMATION OF PRESSING FORCE AND POSITION ADJUSTMENT OF PRESSURE ROLLER

* Equipment Required:
Fan-Type Tension Gauge ... VFK66

1. Playback the cassette tape.
2. Set the Fan-Type Tension Gauge to the part (A) of Main Pressure Arm Unit.
3. Press the Arm with the Gauge, in the direction indicated by the arrow as shown below.

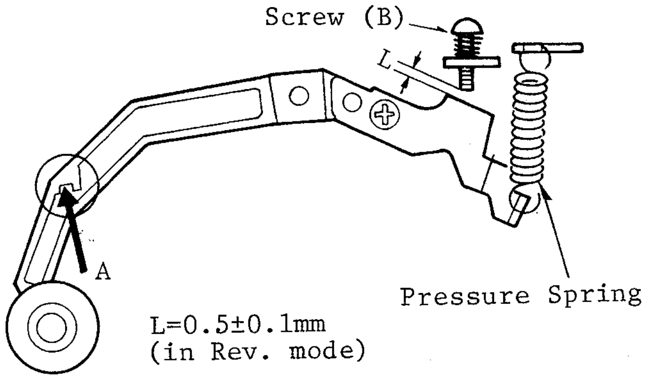


Figure M7

4. Confirm that reading of the Tension Gauge is 1600 ± 350g at the moment of tape stop.
5. If it is out of spec., replace the pressure spring.
6. Connect the Model AG-A600 (Remote Controller) and place the deck in the REV Mode.
7. Turn the screw (B) clockwise by the pliers, so that the clearance (L) becomes 0.5 ± 0.1mm.

3-3. POSITION ADJUSTMENT OF TENSION POST

* Equipment Required:
Tension Post Adjustment Plate
.... VFKS0002
Fine Adjustment Screwdriver
.... VFK0136

1. Remove the Top Case, Cassette Compartment and Bottom plate, and open up the Bottom Circuit Boards.
2. Viewing from the bottom side, slowly turn the Large Pulley counterclockwise by finger until the unit is in the play mode position (Figure M7)

Note:
Do not use excessive force to turn the pulley.

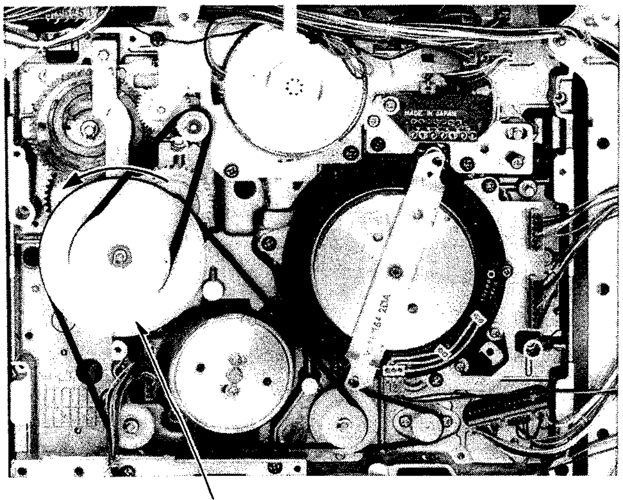

Large Pulley

Figure M8

3. Place the Tension Post Adjustment Plate (VFKS0002) over the Reel Tables.
4. Slightly loosen the screw (A) securing the Tension Band Bracket. (Figure M9).
5. Insert the Fine Adjustment Screwdriver into the adjustment hole (B) next to the screw and adjust the Tension Band Bracket so that the Tension Post just touches the Tension Post Adjustment Plate. (Figure M9)

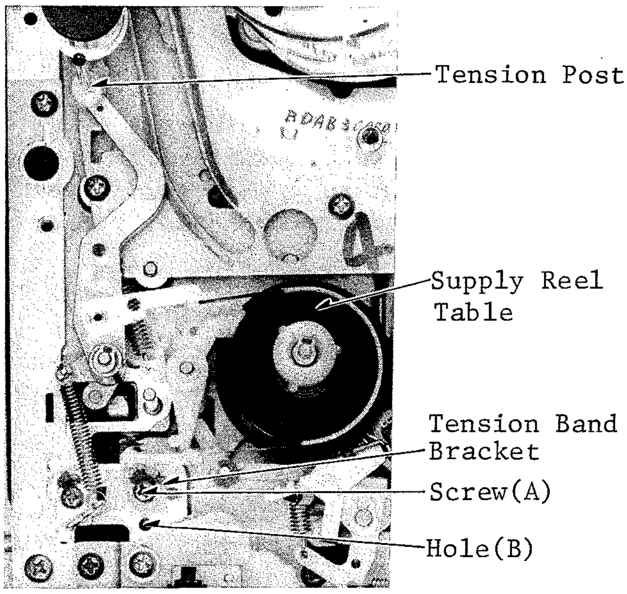

Tension Post
Supply Reel Table
Tension Band Bracket
Screw(A)
Hole(B)

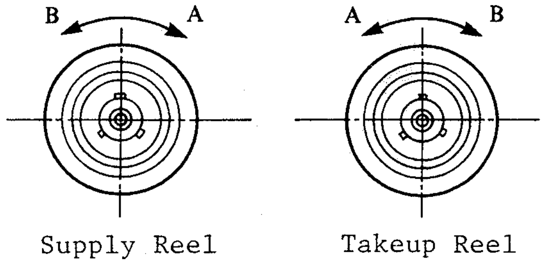
Figure M9

3-4. CONFIRMATION/ADJUSTMENT OF THE BRAKE TORQUE

A. Confirmation Procedure

* Equipment Required:
Torque Gauge VFK0133
Adaptor for Gauge VFK0134

1. Remove the Top Case and the Cassette compartment.
2. Attach the adaptor to the torque gauge and place the deck in STOP mode.
3. Place the torque gauge on the reel table.
   The weight of the gauge should not rest on the reel table.
4. Turn the torque gauge in the direction indicated in Figure M10 until the brake begins slipping and read the torque.


B
A
A
B
Supply Reel
Takeup Reel

	A	B
Takeup	450 ∿ 800 g-cm	70 ∿ 150 g-cm
Supply		

Figure M10. Brake Torque Spec.

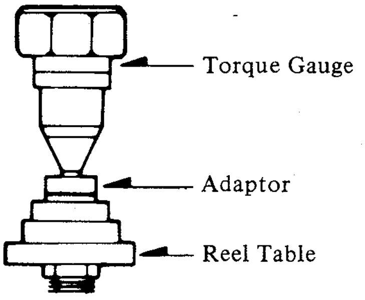

Torque Gauge
Adaptor
Reel Table

Figure M11. Measuring Method

Adjustment Procedure

To adjust the brake torque, move the spring to a different notch on the brake arm. Increase the brake torque by moving the spring to an outer notch and decrease the brake torque by moving the spring to an inner notch.

Note:
If the proper brake torque cannot be obtained by changing the position of the spring, clean the brake surface of the reel table with a soft cloth and remeasure the brake torque. If it is still out of specification, replace the Brake Arm Unit.

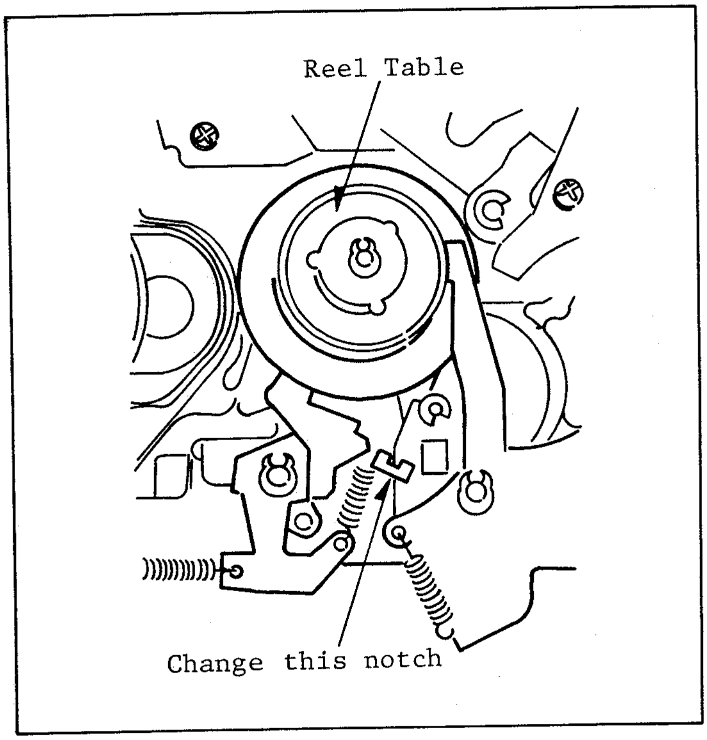


Figure M12. Adjustment of Brake Torque

3-5. CONFIRMATION OF TAKEUP TORQUE

* Equipment Required:
Dial Torque Gauge VFK0133
Adaptor for Gauge VFK0134

* Specification:
in FF Mode .... more than 400g-cm
in REW Mode .... more than 400g-cm

1. Remove the Top Case and the Cassette Compartment.
2. Attach the adaptor to the torque gauge and blind the takeup and supply photo transistors with pieces of black tape.
   Lower the cassette compartment and turn the power switch on.
3. Set a torque gauge on the Takeup Reel Table, push the FF button and read torque on gauge.

Note:
While measuring, the weight of the gauge should not rest on the reel table.

4. Set the torque gauge to the Supply Reel Table, Push the rewind button for rewind mode. And read the torque on gauge.

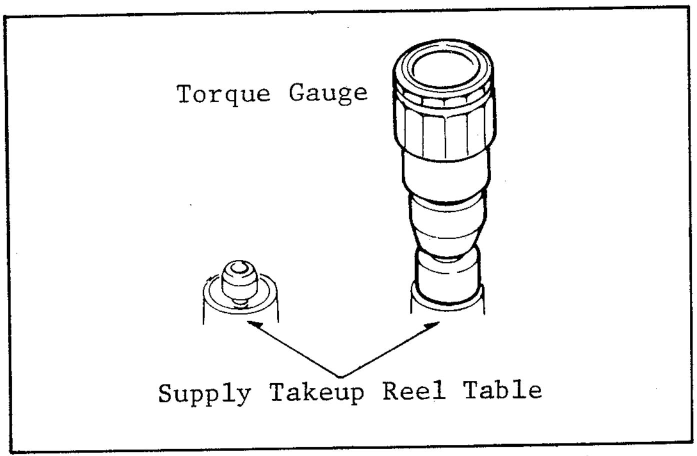


Figure M13. Measuring Method

5. Remove the black tape from the takeup and supply photo transistors.

Note:
There are no-adjustment here.
If the torque readings are off considerably, rollers or idlers or reel tables may need replacement.

3-6. MEASUREMENT AND ADJUSTMENT OF THE BACK TENSION

. Measurement Procedure

* Equipment Required:
Back Tension Meter (Tentelometer, Model T2-H7-UM)
VHS Cassette Tape (120-minute tape)

Specification .... 25 ∿ 30g

1. Remove the Top Case and the Cassette Compartment.
2. Pull the erase head in the direction indicated by the arrow in Figure M14 secure it with a piece of adhesive tape.
3. Play back the cassette tape from the beginning and wait until the tape movement has stabilized. (for approx. 10 to 20 seconds)
4. Insert tension meter over the tape and take a reading.

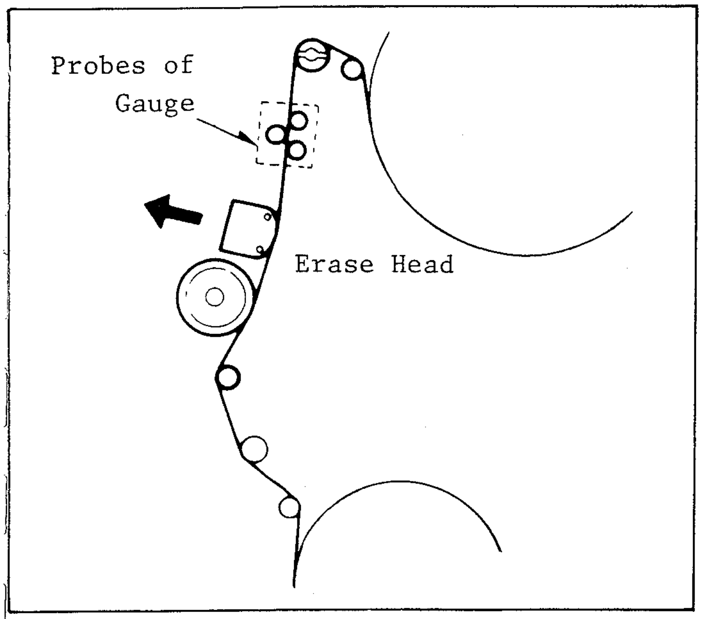


Figure M14. Measurment of Back Tension

Note:
1. While measuring, make sure that the three probes of the meter are all in good contact with the tape, and out of contact with the supply inertia roller.
2. As the tension meter is very sensitive, we recommended taking 3 separate rendings.

B. Adjustment Procedure

* Equipment Required:
Fine Adjustment Screwdriver VFK0136

1. Remove the Top Case and the Cassette Compartment.
2. Loosen the screw (A) and insert the fine adjustment screwdriver into the hole (B).
3. Move the adjustment plate in either of the directions indicated by the arrow in Figure M15 to obtain the specified tension. Turn the driver clockwise to decrease the tension, counter-clockwise to increase it.
4. Tighten the screw (A) and remeasure the tension with the meter to confirm it.

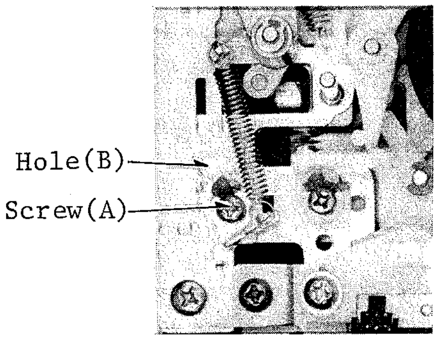


Figure M15

3-7. ADJUSTMENT OF THE REEL TABLE HEIGHTS

* Equipment Required:
Post Adjustment Plate VFKS0010
Reel Table Height Gauge VFKS0009

* Specification:
0.1mm ± 0.1mm

1. Remove the Top Case and the Cassette Compartment.
2. Place the Post Adjustment Plate over the reel tables.
3. Place the Reel Table Height Gauge on the plate so that the scraper of the gauge touches the cut-out portion of the plate, then set the gauge to zero ("0").

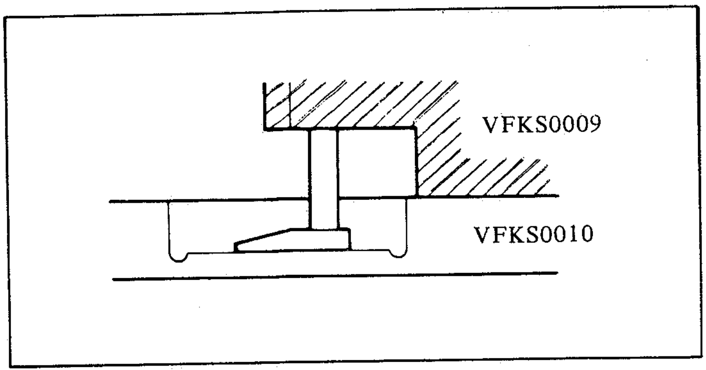


Figure M16

4. Measure the height of the top surface of either reel table and note the difference in height from the plate cut-out.
   Repeat this procedure for the other reel table.
5. If the difference is more than 0.1mm higher or lower, replace the poly slider washer located under the reel table with one of the appropriate thickness.
   Poly slider washers are available in thickness of 0.13mm, 0.25mm and 0.5mm.

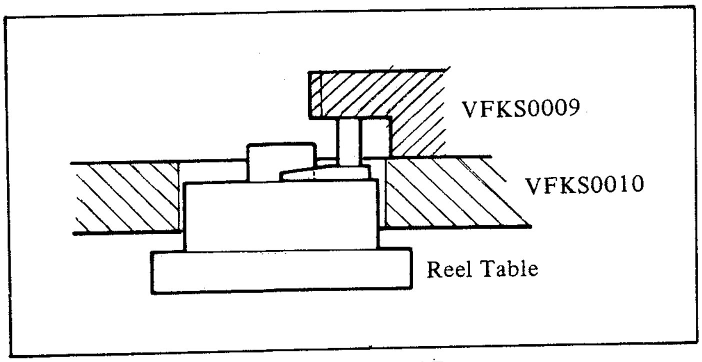


Figure M17

3-8. ADJUSTMENT OF THE TAPE GUIDE POST HEIGHTS

* Equipment Required:

0.9mm Hex Wrench	VFK0146
Post Adjustment Plate	VFKS0010
Reel Table Height Gauge	VFKS0009
Nut Driver (purchase locally)	
Post Adjustment Screwdriver	VFK0137

1. Remove the Top Case and the Cassette Compartment.
2. Place the Post Adjustment Plate over the reel tables.

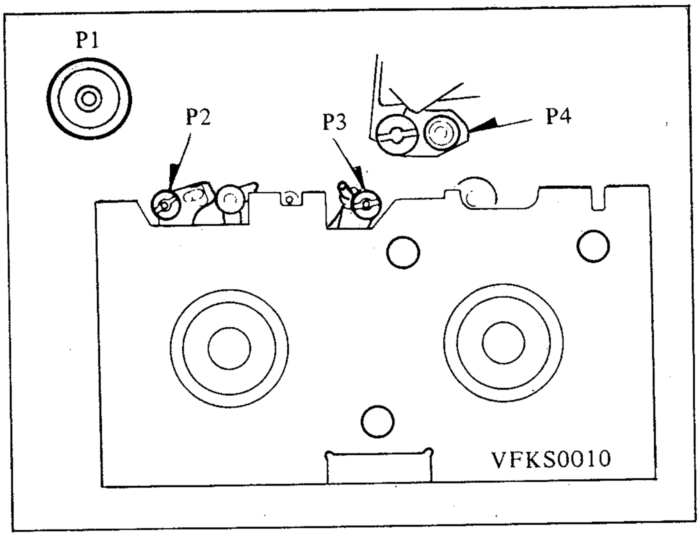


Figure M18

3. Loosen the hex screw located under the lower tape guide on posts P2 and P3, and remove the post cap on post P4 by turning it counter-clockwise.
4. Lower all 4 tape guide posts so that the lower tape guide on each post is below the top surface of the adjustment plate.
   Use the Post Adjustment screwdriver to lower posts P2 and P3, and the Nut Driver to lower posts P1 and P4.
5. Place the Reel Table Height Gauge on the Post Adjustment Plate and lower the scraper so that it touches the plate.

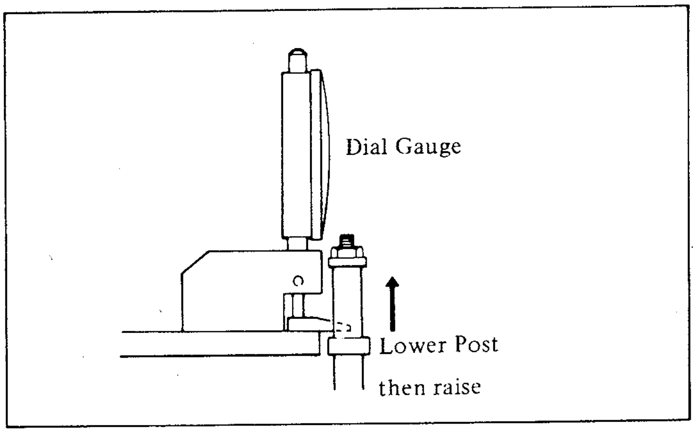


Figure M19

6. Place the side of the scraper against the each post as shown in Figure M19, set the gauge to zero, yhen slowly raise the post until the lower tape guide just touches the bottom of the scraper. Use the gauge to determine the exact point at which the lower tape guide touches the scraper.

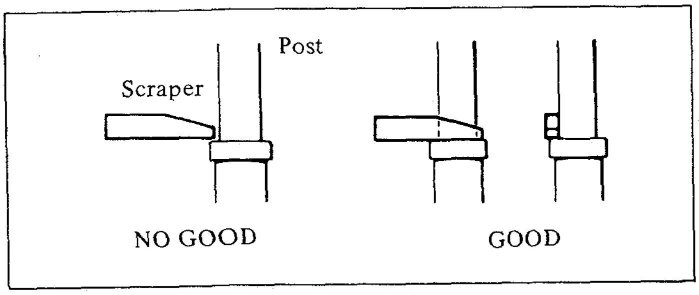


Figure M20

7. Tighten the hex screws on posts P2 and P4. (Figure M21).

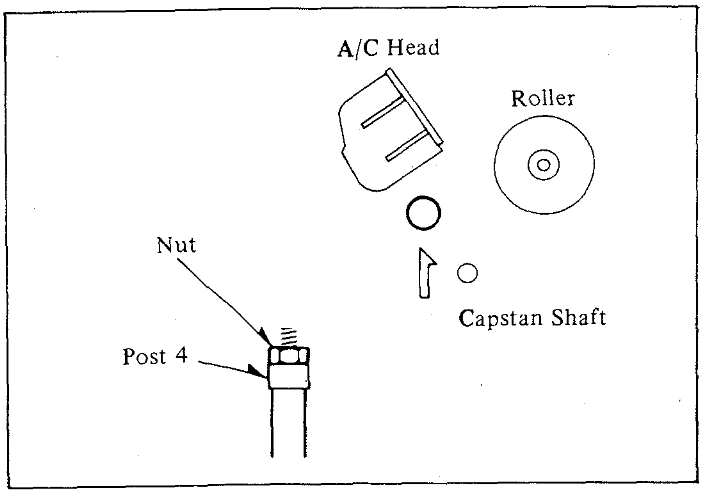


Figure M21

3-9. ADJUSTMENT OF THE PULL-OUT POST HEIGHT

* Note:

1. This adjustment should be performed only after adjusting tape guide post P4 as the height of the pull-out post is based on the height of post P4.
2. This adjustment should be performed with the unit in the loading-completion mode.
3. When replacing or adjusting the pull-out post, unplug the unit from the power source.

* Tools and Equipment:
Post Adjustment Plate VFKS0010
Reel Table Height Gauge VFKS0009
Nut Driver (purchase locally)

* Specification:
0.025mm±0.01mm

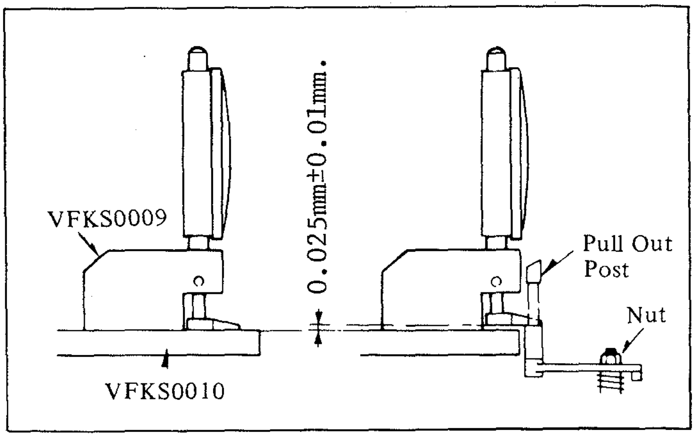


Figure M22

1. Remove the Top Case and the Cassette Compartment.
2. Turn the power switch on.
3. Insert a cassette tape to the Cassette Compartment, then press the play button. This simulates the loading completion mode.
4. Unplug the unit from the power source.
5. Place the Post Adjustment plate over the reel tables.
6. Place the Reel Table Height Gauge on the Post Adjustment Plate, lower the scraper so that it touches the plate, then set the gauge to zero ("0").
7. Slightly lower the pull-out post by turning the nut on the post clockwise with the nut driver, and set the side of the scraper against the post as shown in Figure M23.

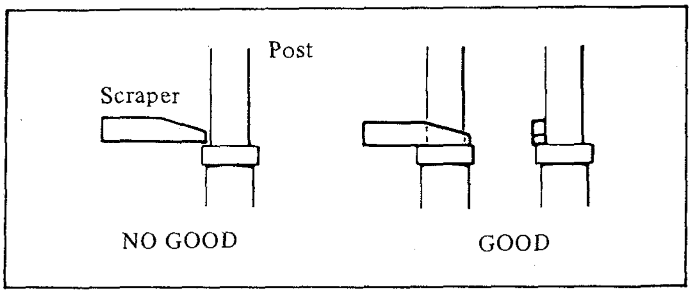


Figure M23

8. Slowly turn the nut on the post counterclockwise until the gauge reads 0.025mm ± 0.01mm.
9. Plug the unit back into the power source to "unload" the unit, then reinstall the Cassette Compartment.

3-10. TAPE INTERCHANGEABILITY ADJUSTMENT

* Note:
Be sure that the tracking control is set in the center detent (fited) position before performing this adjustment.

* Equipment Required:

Alignment Tape	VFK8080H2
Post Adjustment Screwdriver	VFK0137
H-Position Adjustment Screwdriver	VFKS0003
Hex. Wrench (1.5mm)	VFK76

Confirmation of Tape Travel

To prevent the alignment tape from being damaged, use a normal cassette tape for this procedure.

1. Playback the cassette tape and confirm that the tape travels without curling at the edges.
2. If curling is apparent, adjust the height of posts by turning the top of post with the post adjustment screwdriver (Posts P2 and P3) or the nut driver (Post P1).

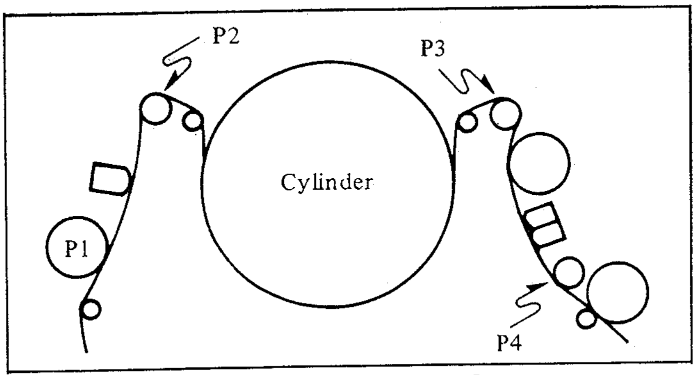


Figure M24. Loading of Posts

Note:
Before attempting to adjust posts P2 and P3, slightly loosen the hex screw located below the lower tape guide on each post.

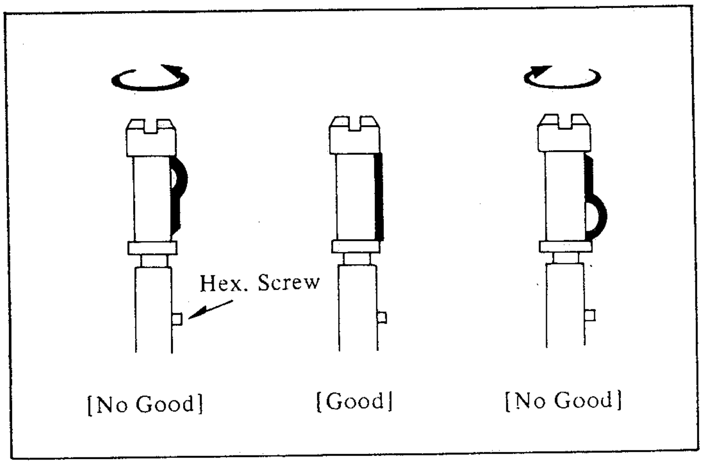


Figure M25

3-11. CONFIRMATION OF THE A/C HEAD HEIGHT

* Note:
This procedure should be performed only when the A/C Head is replaced.

With the tape running, lock at the lower edge of the control head check to see that the lower edge of tape runs along the lower edge of the control head.
If it doesn't, slightly turn the nut (A) behind the A/C Head (Figure M26) to either lower or raise the A/C head so that the tape runs along the lower edge of the control head.
Turn the nut (A) clockwise to lower the head, and counterclockwise to raise it.

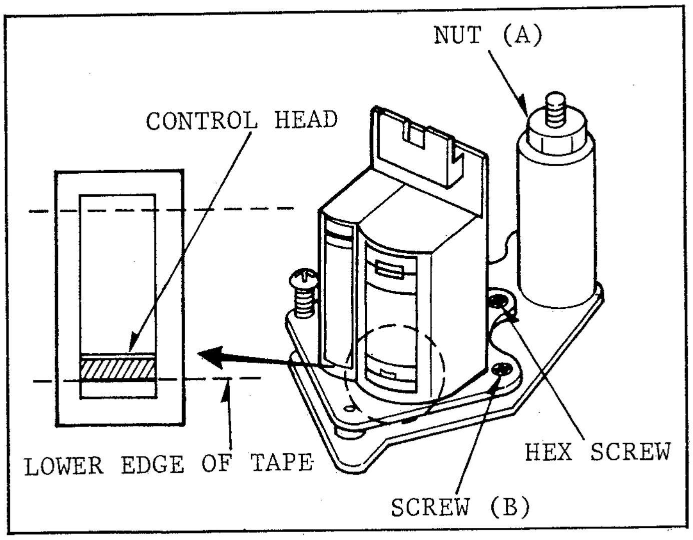


Figure M26

3-12. ADJUSTMENT OF THE A/C HEAD HEIGHT

1. Connect the oscilloscope to the audio output on the rear of the deck.

2. Playback the monoscope portion (6kHz, Audio) of the alignment tape, VFM8080H2.
3. Adjust the Hex screw and the screw (B) or the head base so that the output level is maximized (Figure M26, M27).

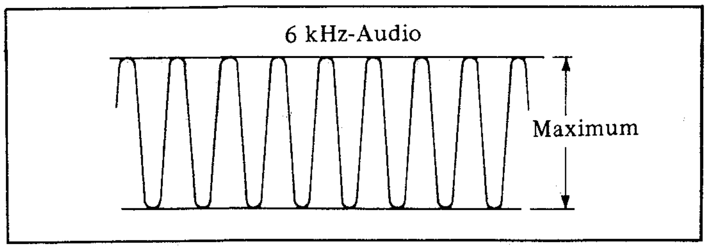


Figure M27. Adj. of the A/C Head Height

3-13. CONFIRMATION OF THE A/C HEAD TILT

* Note:
This procedure should be performed only after adjusting the height of tape guide post (P4). (Refer to "ADJUSTMENT OF TAPE GUIDE POST HEIGHTS".)

Playback the tape and confirm that the tape runs between lower and upper limiters of the post. If there is waving or frilling in the lower edge or top edge of the tape, correct the tilt of the A/C head by turning the Hex screw located behind the A/C Head (Figure M28).

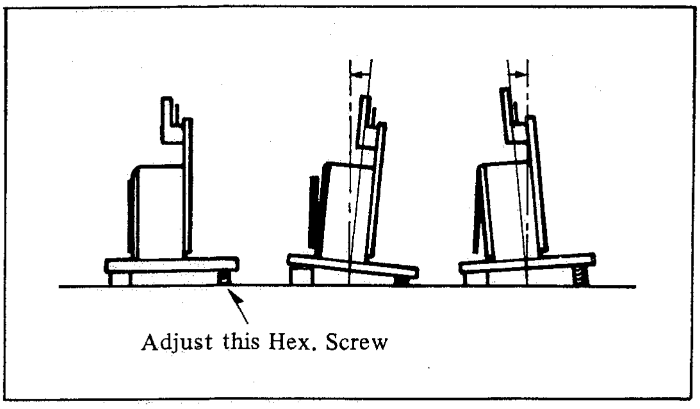


Figure M28. A/C Head Tilt Adj.

3-14. ADJUSTMENT OF A/C HEAD TILT

1. Connect the osilloscope to TP1 on the Mechanism Conn. C.B. Use TP2 to Ext-Trigger the oscilloscope.
2. Playback the monoscope portion of the alignment tape, VFM8080H2.
3. Adjust the hex screw located behind the A/C head so that the RF envelope output level is maximized.

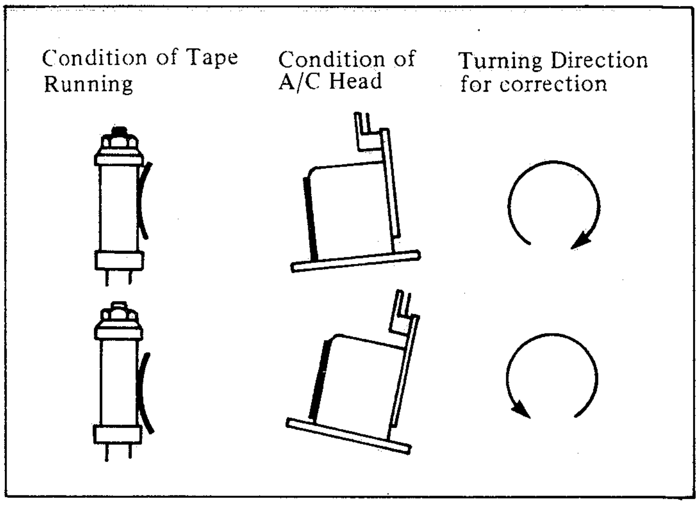


Figure M29

3-15. ADJUSTMENT OF THE A/C HEAD HORIZONTAL POSITION

1. Connect the oscilloscope to TP1 on the Mechanism Conn. C.B. Use TP2 to Ext-Trigger the oscilloscope.

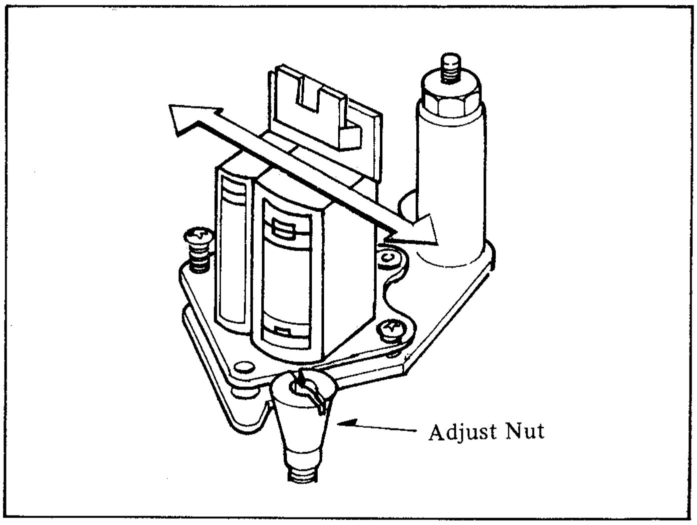


Figure M30

2. Playback the monoscope portion of the alignment tape (VFM8080H2) and check the scope of the envelope.
3. If adjustment is required, turn the adjustment nut with the H-position adjustment screwdriver so that the envelope output is maximized.

3-16. CONFIRMATION OF THE ENVELOPE OUTPUT (NORMAL)

1. Set the Tracking Control VR in the center detent (fixed) position.
2. Connect the oscilloscope to TP15 on the Hi-Fi Audio Circuit P.C.B. and TP7 on the same board to Ext-trigger the oscilloscope.
3. Playback the monoscope portion of the alignment tape VFJ8002HMF.
4. Adjust tape guide posts P2 and P3 so that the RF envelope on the oscilloscope is as flat as possible. ($V1/V \geqq 0.7$, $V2/V \geqq 0.8$)

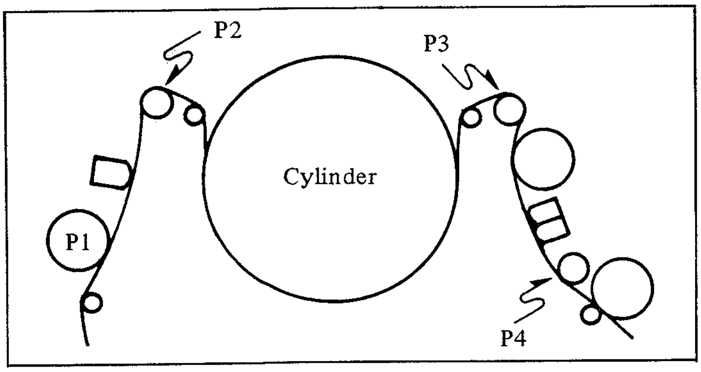


Figure M31. Loading of Posts

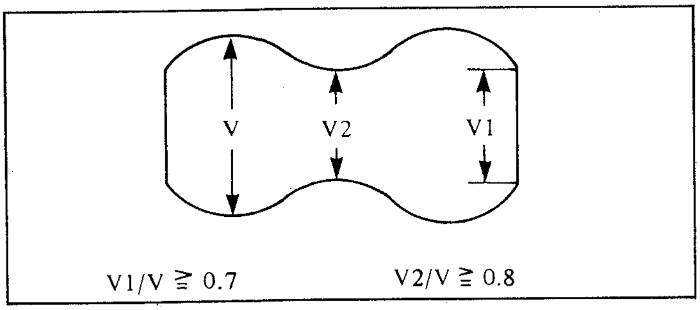


Figure M32. Spec. of Envelope Figure

3-17 ADJUSTMENT OF CAM GEAR AND MODE SELECT SWITCH

General Condition:

The mechanism of this model is mostly engaged to the electrical circuit, System Control Circuit, through the mode select switch. Therefore the relation between the mode switch and the cam gear decides all further mechanical movement of the mechanical parts such as levers, gears, rollers and so on.
If the adjustment of this item is performed improperly, the deck will be unloaded or compulsorily stopped. And it will result being damaged at any mechanical or electrical parts.

Note:
Before the adjustments, turn power switch on and insert a cassette tape then set the mode select switch to the stop position, and plug off.

A. Adjustment Procedures of Cam Gear

1. Turn Loading gear clockwise until the post 2 and 3 were fully unloaded. The small projection on the loading gear will be top portion under the condition of Unloading Completion.

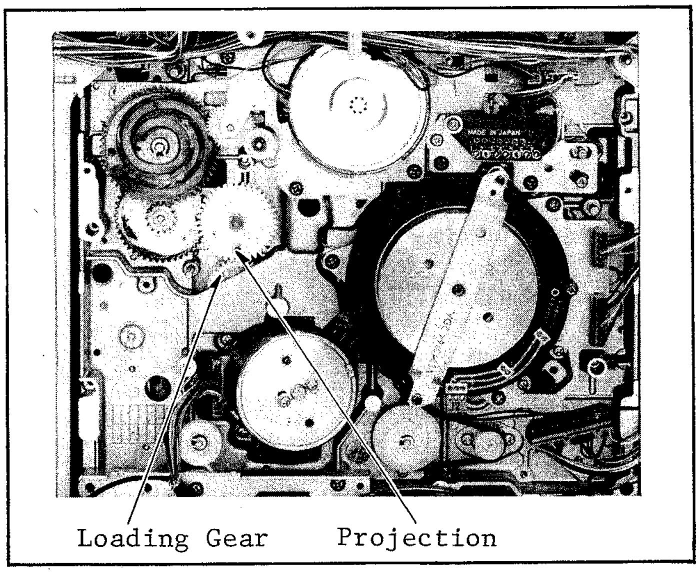


Figure M33

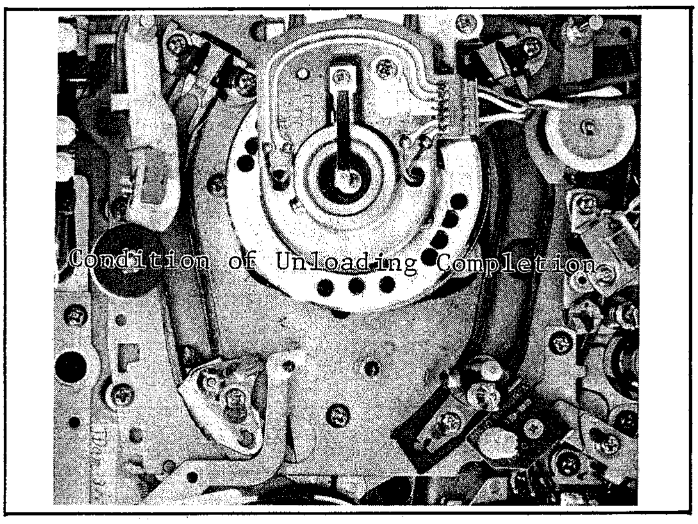


Figure M34

2. Install the action gear so that the 4th dimple to the left from the hole on the action gear meets the projection on the loading gear. Ensure that the loading gear is still in the condition of the unloading completion.

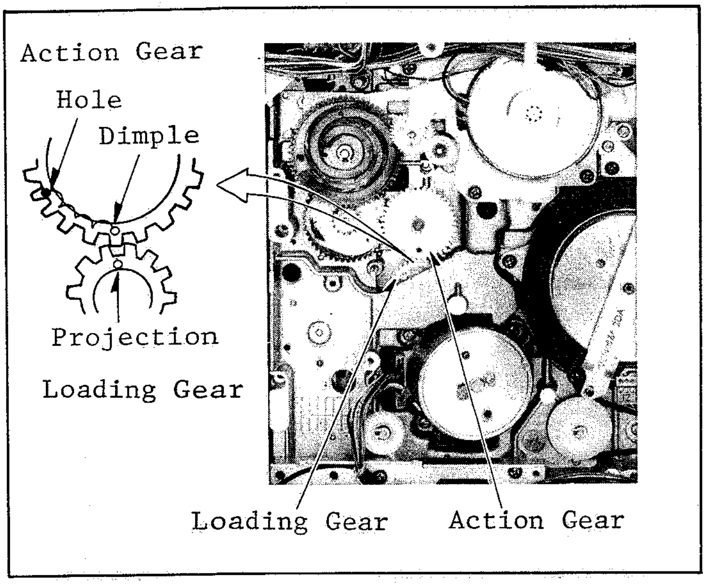

Action Gear
Hole
Dimple
Projection
Loading Gear
Loading Gear
Action Gear

Figure M35

3. Slowly slide the main lever so the V-shaped mark meets the V-shaped mark of the mode select switch. With the result, main lever and mode select switch are in a position to be stop(unloading completion) mode.
4. Insert the cam gear so the hole (A) on the gear meets the hole on the main lever. To meet the two holes easier, use the small hex. wrench (VFK75) or metal pin. Also ensure the 2 V-shaped marks are fixed.

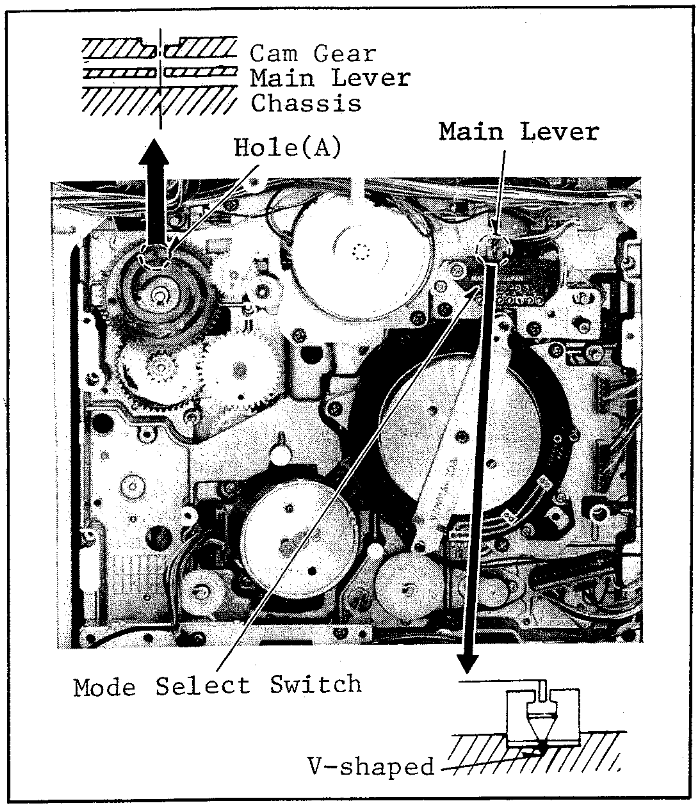

Cam Gear
Main Lever
Chassis
Hole(A)
Main Lever
Mode Select Switch
V-shaped

Figure M36

5. Install the sector gear so the pin on the sector gear meets the inner slot of the cam gear (simple slot side). And install 2 retaining rings to mount cam gear and sector gear.

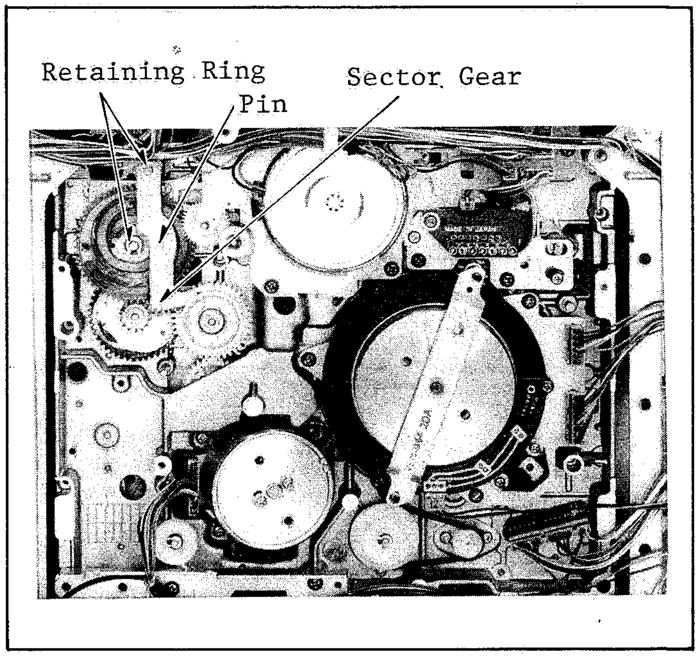

Retaining Ring
Pin
Sector Gear

Figure M37

6. Final figure should become as shown below, and at the same time 2 V-shaped marks are fixed at the mode select switch.

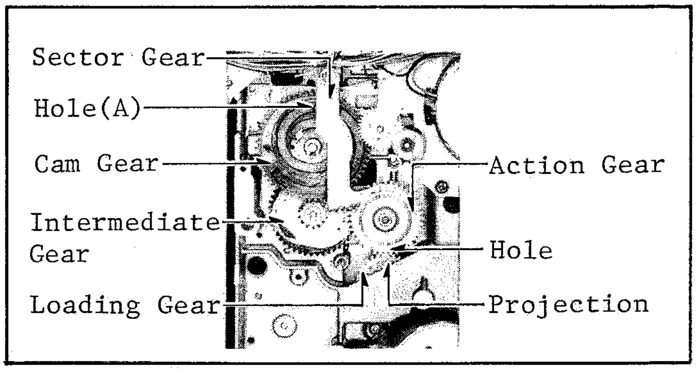

Sector Gear
Hole(A)
Cam Gear
Intermediate Gear
Loading Gear
Action Gear
Hole
Projection

Figure M38

7. Install the gear protector and tighten the nut for mounting it. And install the large gear so the teeth of it contact the outer teeth of the intermediate gear. Then install a retaining ring to mount it.
8. Install the belts and belt cover and tighten 2 screws (C). Turn the large pulley in both direction to confirm the smooth movement of this mechanism.

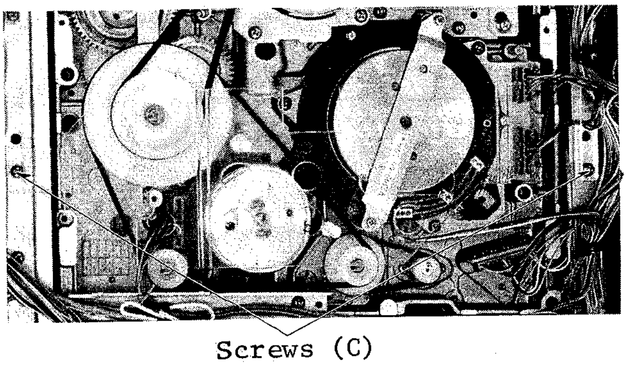


Figure M39

B. Adjustment Procedures of Mode Select Switch

* Equipment Required:
Fine Adjustment
Screwdriver VFK0136

1. Fix the main lever in the condition of unloading completion.
2. Slightly loosen 2 screws (A) and the fine adjustment screwdriver into the hole (B).
3. Turning the fine adjustment screwdriver, adjust the position of the mode select switch so that the 2 V-shaped marks of the mode select switch just correspond at the same position. Then tighten two screws (A).
4. Make sure that the movement of the deck is in normal condition.

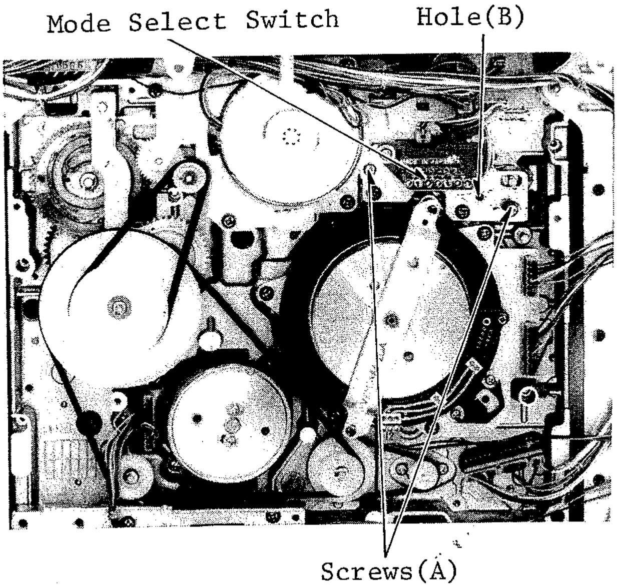


Figure M40

3-18. ADJUSTMENT OF V-STOPPERS

* Equipment Required:
V-Stopper Adjustment
Fixture VFKS0007

1. Remove the 6 screws and open the Bottom P.C. Boards.
2. Remove the 3 screws (A) and carefully lift the DD Cylinder to top of the deck.

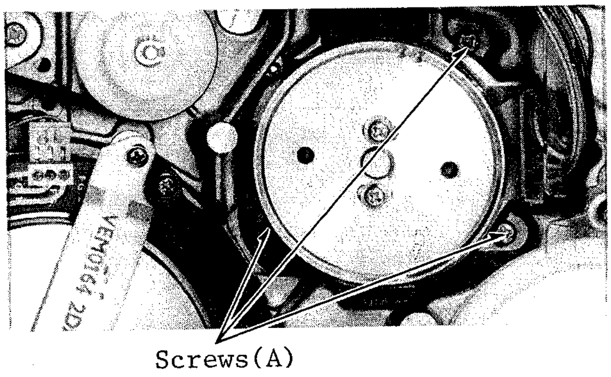


Figure M41

3. Loosen the 4 V-stopper screws (B). Set the V-stopper Adjustment Fixture in place with the 2 setting pins. Push the V-stoppers snugly against the V-stopper pins, then tighten the 4 V-stopper screws (B).
4. Upon completion of the adjustment, simulate the loading-completion mode and confirm that posts fit smoothly against the V-stoppers.

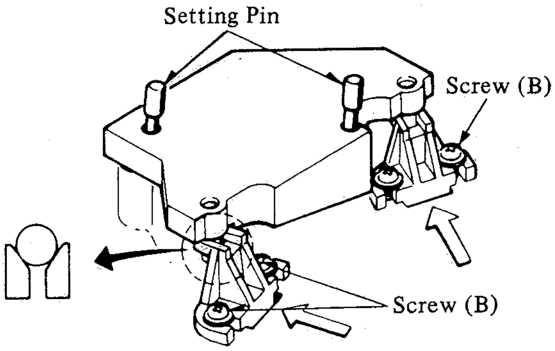
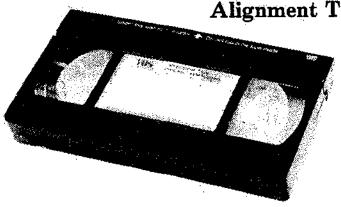


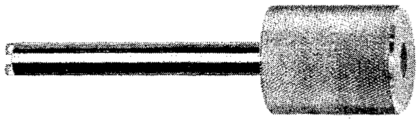
Figure M42

Servicing Fixtures & Tools

VFM8080H2 VHS Alignment Tape
VFJ8002HMF VHS Hi-Fi Alignment Tape

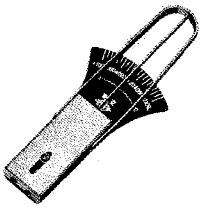


VFK0137 Post Adjustment Screwdriver



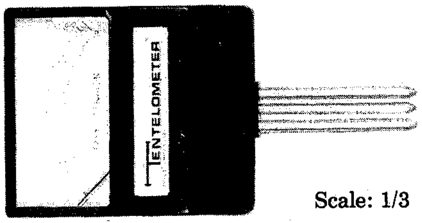
Scale: 1/2

VFK66 Fan Type Tension Gauge



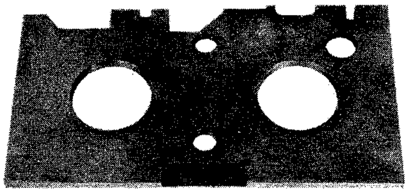
Scale: 1/6

Back Tension Meter (T2-H7-UM)
(Tentelometer, Made in U.S.A.)



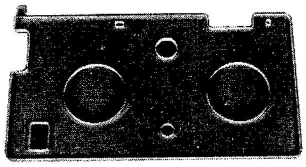
Scale: 1/3

VFKS0010 Post Adjustment Plate



Scale: 1/4

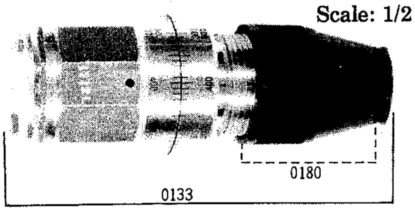
VFKS0002 Tension Post Adj. Fixture



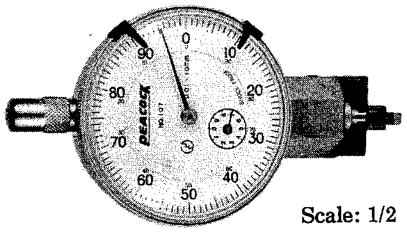
Scale: 1/5

VFK0133 (Dial Torque Gauge)
VFK0180 (Plastic Clamper Only)

Scale: 1/2

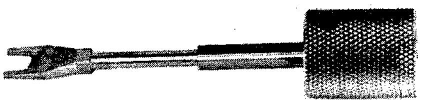


VFKS0009 Reel Table Height Fixture



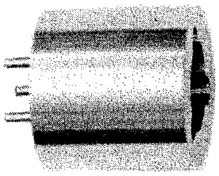
Scale: 1/2

VFKS0003 H-Position Adj. Fixture



Scale: 1/2

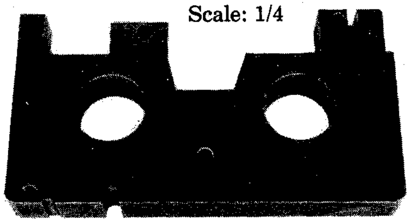
VFK0134 Adaptor for VFK0133



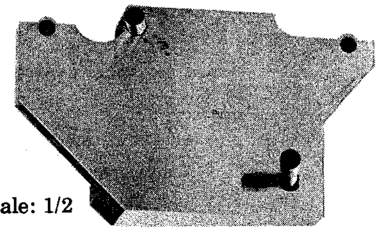
Scale: 1

VFKS0004 Cassette Holder Fixture

Scale: 1/4

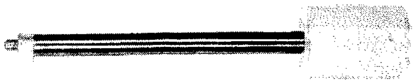


VFKS0007 V-Stopper Adj. Fixture



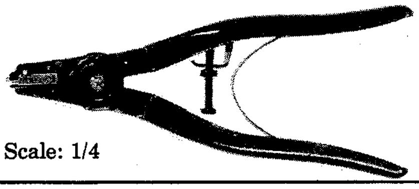
Scale: 1/2

VFK0135 Eccentric Screwdriver



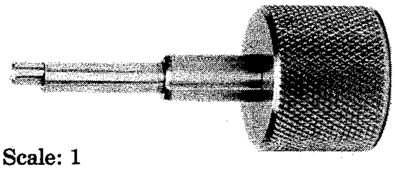
Scale: 3/5

VFK0144 Retaining Ring Remover (3mmϕ)
VFK0145 Retaining Ring Remover (4mmϕ)



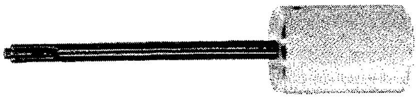
Scale: 1/4

VFK0235 Dihedral Adj. Tool



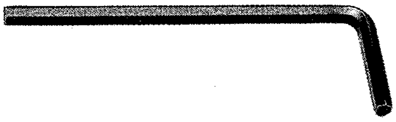
Scale: 1

VFK0136 Fine Adjustment Screwdriver (3mmϕ)

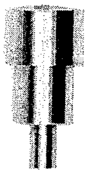


Scale: 1/2

VFK0146 Hex. Wrench (0.9mm)
VFK75 Hex. Wrench (1.25mm)
VFK76 Hex. Wrench (1.5mm)



VFK0268 Stator A. Adj Jig
Scale: 1/1



MOR265 Morlytone Grease

VFK27 Head Cleaning Stick

ELECTRICAL ADJUSTMENT PROCEDURES

This section provides complete electrical adjustment procedures which may be required for electric circuits of VHS video cassette recorder.

TEST EQUIPMENT

To perform the electrical adjustments completely, the following equipment is required.

1. VTVM (Vacuume Tube Volt Meter) or high impedance digital volt meter
   Voltage Range: 0.05-50V
2. Dual Trace Oscilloscope with Delay Function
   Voltage Range : 0.005-5V/div.
   Frequency Range: 20MHz
   Probes : 10:1 and 1:1
3. Frequency Counter
   Frequency Range : 0-10MHz
4. Signal Generator
   Split-Field Color Bar Signal
   Stairstep Signal
   Sinewave Signal
   Frequency Range : 0-10MHz
5. Video Sweep Generator
6. Color TV/Monitor
7. Plastic Tip Driver
8. Spectrum Analyzer
9. Reference Test Tape
   VFM8080H2 : Monoscope Pattern
   (Audio 6kHz)
   Color Bar Signal
   (Audio 3kHz)
   Multi-Burst
   (Audio 1kHz)
   VFJ8002HMF: Color Bar Signal
   (Audio FM 1kHz)

Note:

When started in the Service Manual, the REC mode means Recording with the tape running. The E-E mode means the REC Botton is pressed, but the tape is not running.

ADJUSTMENT PROCEDURES

1. Power Supply Section

Note:
Unless otherwise specified, all test points and controls are located on the Power Supply C.B.A.

1-1. +5V Adjustment

Test Point: TP1001
Adjustment: R1006 (+5V ADJ)

1. Connect the VTVM to TP1001 and GND.
2. Set the unit in REC/PLAY mode.
3. Adjust +5V ADJ R1006 so that the voltage becomes 5V±0.1V.

1-2. +12V Adjustment

Test Point: TP1002
Adjustment: R1015 (+12V ADJ)

1. Connect the VTVM to TP1002 and GND.
2. Set the unit in REC/PLAY mode.
3. Adjust +12V ADJ R1015 so that the voltage becomes 12V±0.1V.

2. System Control Section

Note:
Unless otherwise specified, all test points and controls are located on the System Control C.B.A.

2-1. Reel Moter Current Adjustment

Test Point: TP6001
Adjustment: R6103 (R.M.C.)

1. Connect the VTVM to TP6001 on the System Control C.B.A.
2. Place the unit to the PLAY mode and make sure that the indication of VTVM is to meet the specifications as shown in Fig. E1 on the next page.

MARKING	VOLTAGE(mV)
PINK	200 - 210
BLACK	190 - 200
ORANGE	180 - 190
RED	170 - 180

Fig. E1

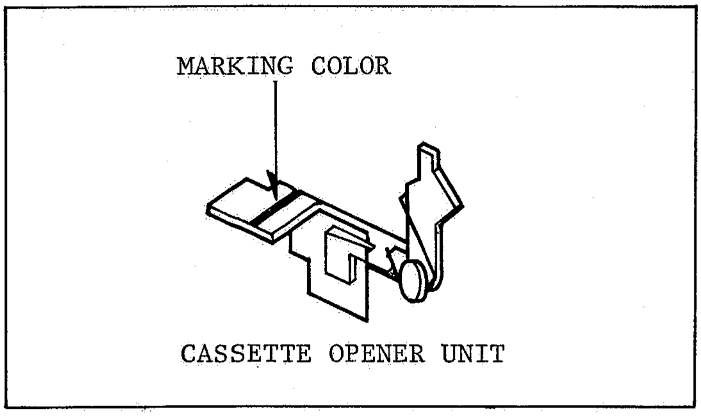


Fig. E2

3. If it is out of specification then adjust the R.M.C. R6106 to meet the specification mentioned above.

3. Servo Section

Note:

Unless otherwise specified, all test points and controls are located on the Servo C.B.A.

3-1. X-Value Shift Adjustment

Test Points: TP2019, 2020
Adjustment: R2001 (X-SHIFT)

1. Connect the scope CH1 to TP2019 and CH2 to TP2020.
2. Set the unit in STOP mode.
3. Adjust X-SHIFT R2001 so that "T" width becomes 7.7±0.1msec.

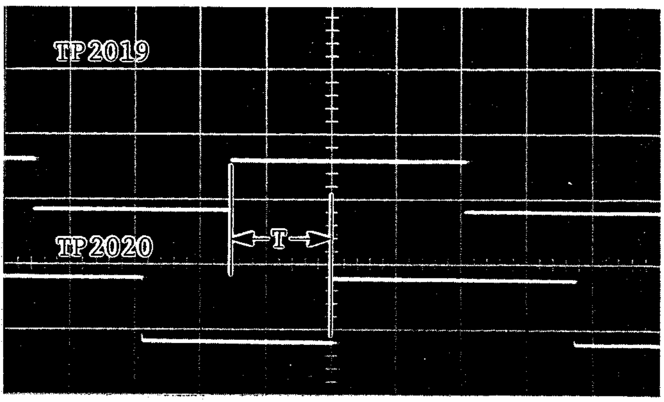


Fig. E3 UP : 5V/5msec. div.
DOWN: 5V/5msec. div.

3-2. PG Shifter Adjustment

Test Point: TP3020, 3019 (Luminance & Chrominance C.B.A.)
TP2004
Adjustments: R2063 (PG1)
R2061 (PG2)

1. Connect the scope to TP3020 on the Luminance & Chrominance C.B.A.
2. Playback the monoscope portion of the alignment tape (VFM8080H2).
3. Adjust the Tracking Control on the Front Panel so that the envelope level becomes maximum.
4. Change the scope CH1 to TP3019 on the Luminance & Chrominance C.B.A. and CH2 to TP2004. Set the scope to CHOP mode and use TP2004 as a trigger signal.
5. Set the triggering slope of scope to the "+" side, and expand the V sync portion of the signal.
6. Adjust PG1 R2063 so that the rising edge of switching pulse is 6.5H±0.5H before the V sync portion.

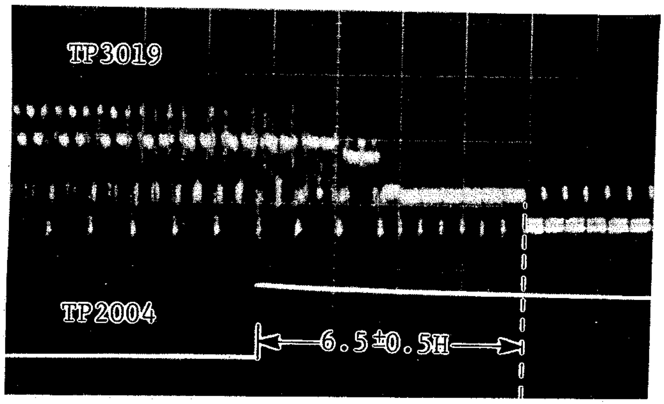


Fig. E4 UP : 1V/0.1msec. div.
DOWN: 5V/0.1msec. div.

7. Change the triggering slope of the scope from "+" to "-" side, and adjust PG2 R2061 so that the difference between the rising and falling edges are less than 10μsec.

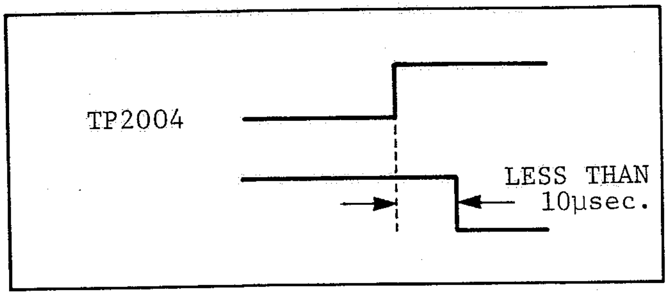


Fig. E11

3-3. Tracking Fix Adjustment

Test Points: TP2004, TP2001
Adjustment: R2064 (TRACKING FIX)

1. Set the Tracking Control on the front panel to the center detent position.
2. Connect the scope CH1 to TP2004 and CH2 to TP2001.
3. Playback the monoscope portion of the alignment tape.
4. Adjust TRACKING FIX R2064 so that the "T" portion becomes 8.1±0.1 msec.

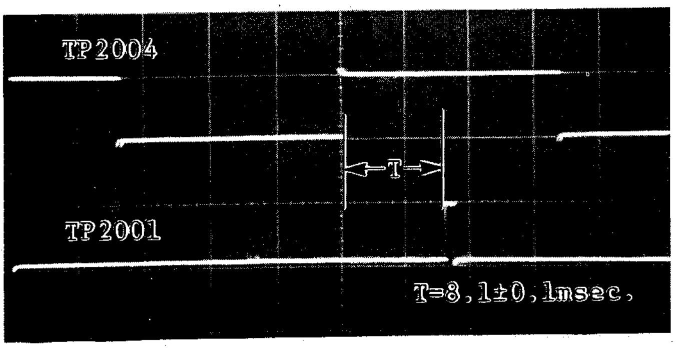


Fig. E6 UP : 5V/5msec. div.
Down: 5V/5msec. div.

4. Luminance & Chrominance Section

Note:
Unless otherwise specified, all test points and controls are located on the Luminance & Chrominance C.B.A.

4-1. E-E Level Adjustment

Test Point: TP3019
Adjustment: R3005 (EE)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel.
2. Connect a scope to TP3019 and set the unit in STOP mode.
3. Adjust EE R3005 so that the level "A" becomes 2.0±0.05Vp-p.

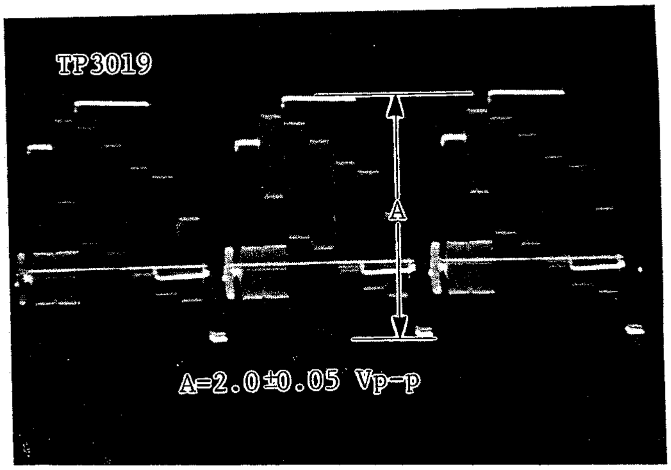


Fig. E7 0.5V/20μsec. div.

4-2. 3.58MHz X'tal OSC Adjustment

Test Point: TP3309
Adjustment: C3343 (3.58OSC)

1. Set the unit in STOP mode.
2. Connect a frequency counter to TP3309.
3. Adjust 3.58 OSC C3343 so that the counter indicates 3,579,545Hz±10Hz.

4-3. AFC Adjustment

Test Point: TP3306
Adjustment: R3337 (AFC)

1. Set the unit in REC/Play mode.
2. Connect a frequency counter to TP3306.
3. Adjust AFC R3337 so that the counter indicates 15,734Hz±100Hz.
4. Supply a color bar signal to the VIDEO INPUT on the rear panel.
5. Adjust AFC R3337 so that the counter indicates 15,734Hz±2Hz.

4-4. APC Adjustment

Test Point: TP3310
Adjustment: C3348 (APC)

1. Connect a jumper wire between TP3311, 3302 and ground.
2. Connect a frequency counter to TP3310.
3. Adjust APC C3348 so that the counter indicates 3,579,545Hz±50Hz.

4-5. Sync Tip & Deviation Adjustment

Test Point: TP3003
Adjustments: R3018 (DEV)
C3023 (SYNC TIP)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel.
2. Connect a scope to TP3003 with an 1:1 probe.
3. Turn the resistor R3028 fully clockwise and resistor R3029 fully counterclockwise.
4. Supply a 3.4MHz sinewave signal at -40dB (0.028Vp-p) to TP3004 through a 0.01μF capacitor. Set the frequency precisely with a frequency counter.
5. Set the unit in REC/PLAY mode.
6. Adjust SYNC TIP C3023 so that the beat on the sync tip portion of the signal becomes minimum as shown in below.

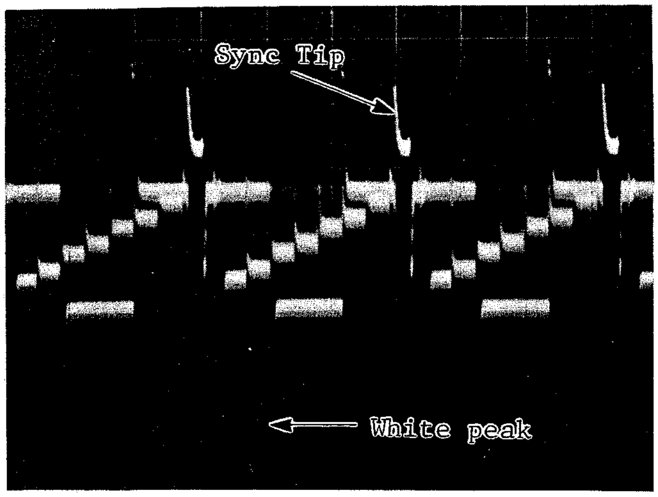


Fig. E8 0.1V/20μsec. div.

7. Next reset the oscillator to supply a 4.4MHz sinewave signal at -40dB (0.028Vp-p) to TP3004 through the 0.01μF capacitor. Set the frequency precisely with a frequency counter.
8. Adjust DEV R3018 so that the beat on the white peak portion of the signal becomes minimum as shown above.

4-6. White Clip & Dark Clip Adjustment

Test Point: TP3003
Adjustments: R3028 (DARK CLIP)
R3029 (WHITE CLIP)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel.
2. Connect a scope to TP3003 with an 1:1 probe.
3. Set the unit in REC/PLAY mode.
4. Adjust DARK CLIP R3028 so that the dark clip portion becomes 50%±5%.
5. Adjust WHITE CLIP R3029 so that the dark clip portion becomes 70%±5%.

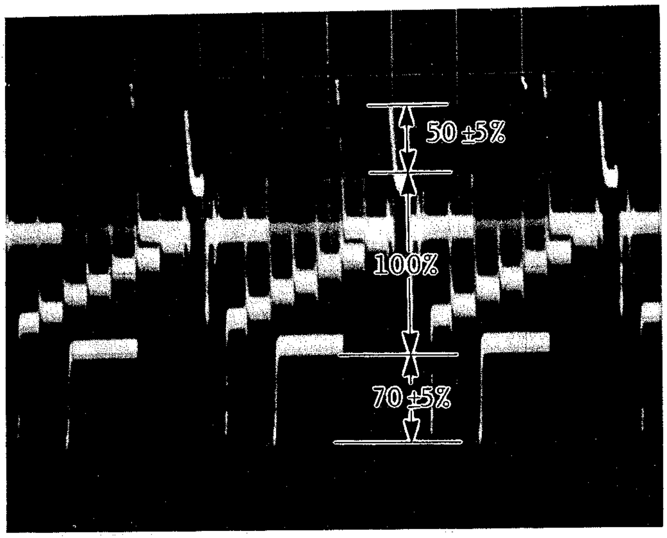


Fig. E9. 0.1V/20μsec. div.

4-7. REC Current Adjustment

Test Points: TP3007 (HOT), TP3008 (GND)
Adjustments: R3051 (REC CHROMA)
R3039 (REC-Y)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel.
2. Set the unit in REC/PLAY mode.
3. Connect a jumper wire between TP3005 and ground.
4. Connect a scope to TP3007 (HOT) and TP3008 (GND).
5. Adjust REC CHROMA R3051 so that the level "C" becomes 40±4mVp-p.

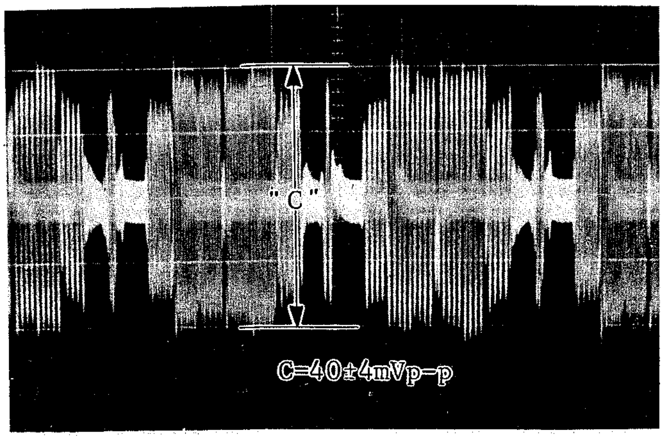


Fig. E10. 10mV/20μsec. div.

6. Disconnect the jumper wire.
7. Adjust REC-Y R3039 so that the level "Y" becomes 145±5mVp-p.

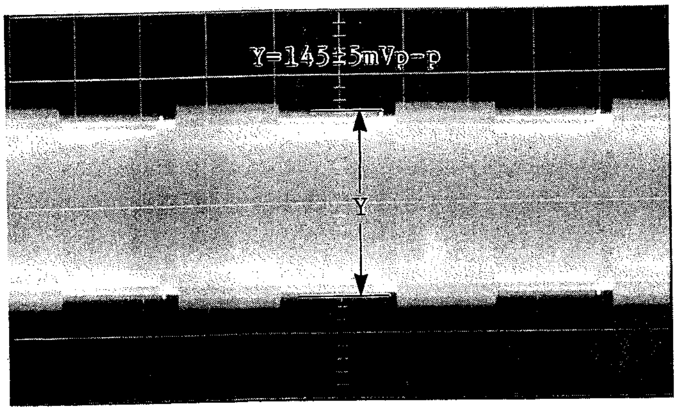


Fig. E11 50mV/5msec. div.

4-8. Head Amp Peak Frequency Adjustment

Preadjustment Procedures.

Set the sweep generator output as shown in Fig. E12. (Amplitude value of this waveform is terminated with 75Ω.)

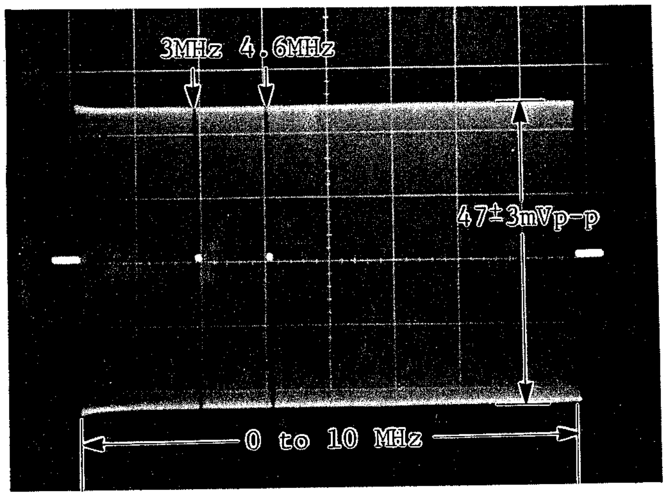


Fig. E12 10mV/2msec. div.

Prepare the following empty cassette tape. Connect circularly the Supply Reel Hub and Takeup Reel Hub of a cassette by the tape as shown in Fig. E13.

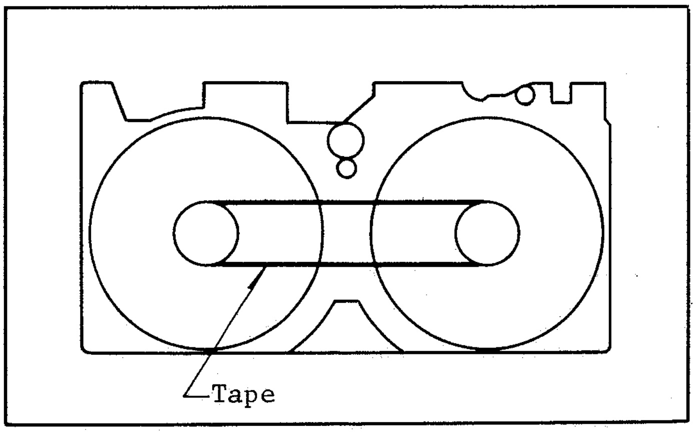


Fig. E13

Adjustment Procedures

(A) NORMAL Mode

Test Point: TP3020
Adjustments: R3063 (Q-L),
R3072 (Q-R),
C3047 (PEAK-L),
C3048 (PEAK-R)

1. Supply the sweep generator signal as show in Fig. E9 to TP3006.

2. Connect a scope to TP3020 and use the trigger out signal of the sweep generator as the external trigger.
3. Insert a empty cassette and set the unit in PLAY mode.
4. Adjust R3063 (Q-L) and R3072 (Q-R) so that both channel peak levels become 0.4Vp-p.
5. Next, adjust PEAK-L C3047 and PEAK-R C3048 so that waveforms become as shown in Fig. E14.

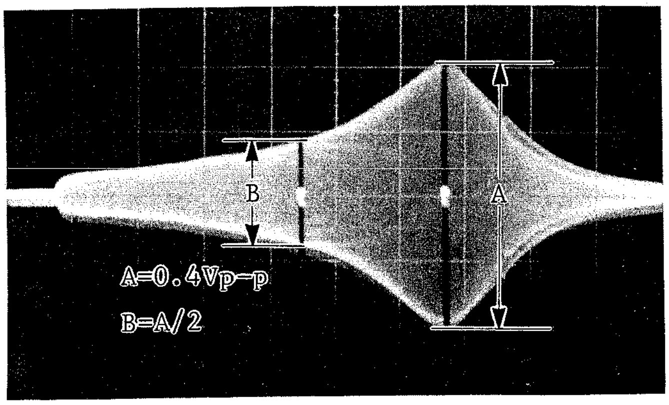


Fig. E14 0.1V/1msec. div.

4-9. Head Amp Frequency Characteristics Adjustment

Pre-adjustment Procedures

1. Set the sweep generator output as shown below. (Amplitude values of this waveform are terminated with 75 Ω.)

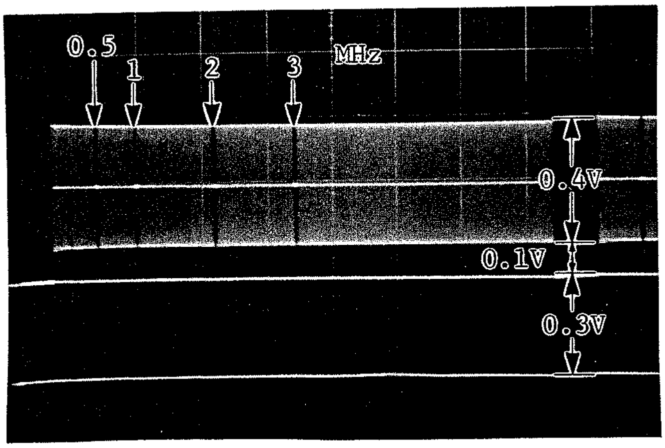


Fig. E15 0.2V/2msec. Div.

2. Supply above signal to the VIDEO INPUT on the rear panel and make a short recording.

Adjustment Procedures

(A) NORMAL

Test Points: TP3016, 3019
Adjustments: R3067 (NOR.MIX),
R3069 (NOR.LEV),
R3063 (Q-L),
R3072 (Q-R)

1. Turn Q-L R3063 and Q-R R3072 fully clockwise.
2. Connect a scope to TP3016. Playback the just recorded portion.
3. Adjust NOR.MIX R3067 so that both channel levels become same. Next adjust NOR.LEV R3069 so that the level becomes 1.1Vp-p.

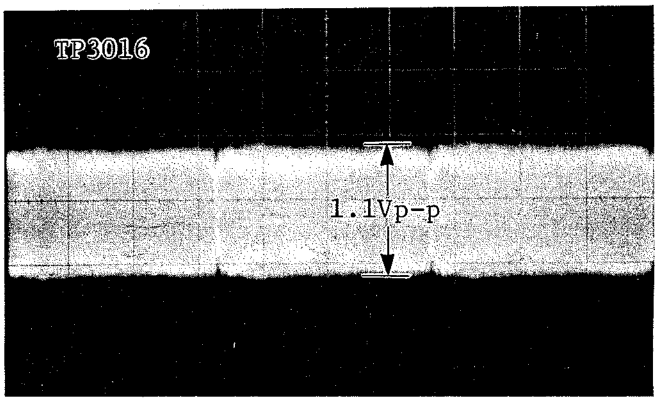


Fig. E16 0.5V/5msec. div.

4. Change the probe to TP3019 from TP3016.
5. Slowly turn Q-L R3063 and Q-R R3069 counterclockwise so that the distortion is disappeared at 1MHz-2MHz portion as shown in Fig. E17.

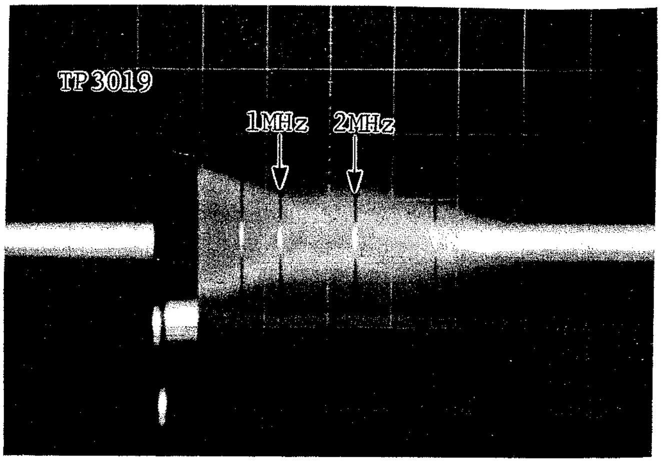


Fig. E17 0.2V/2msec. div.

4-10. Dropout Compensator Input Level Adjustment

Test Point: TP3016
Adjustments: R3069 (DOC NOR)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel.
2. Set the unit in REC/PLAY mode.
3. Playback the just recorded portion.
4. Connect the scope to TP3016.
5. Adjust DOC NOR R3069 so that both channel level "A" and "B" become 1.1±0.1Vp-p.
   If both levels are not same, adjust R3067.

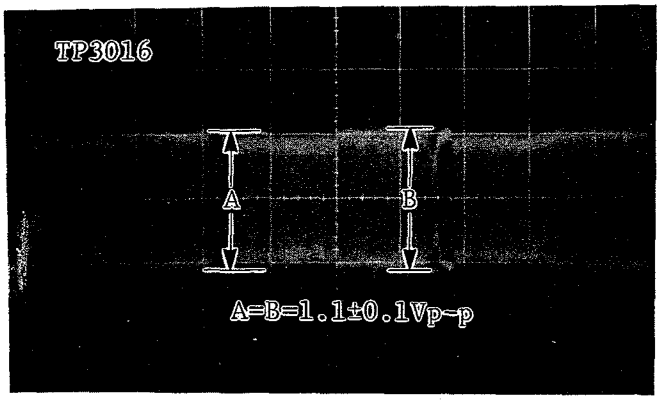


Fig. E18 0.5V/5msec. div.

4-11. Limiter Balance Adjustment

Test Point: TP3017
Adjustments: R3122 (BAL1)
R3147 (BAL2)

1. Supply a sweep generator signal to TP3006. Use the markers at 2MHz, 3.4MHz and 6MHz.
2. Insert a empty cassette and set the unit in PLAY mode.
3. Connect a scope to TP3016 and adjust the sweep out level so that the level becomes 1Vp-p at 4MHz portion.
4. Change the probe to TP3017 from TP3016.
5. Adjust BAL1 R3122 so that the "A" portions of both channel are balanced.
6. Adjust BAL2 R3147 so that the beat of "B" portion becomes minimum.

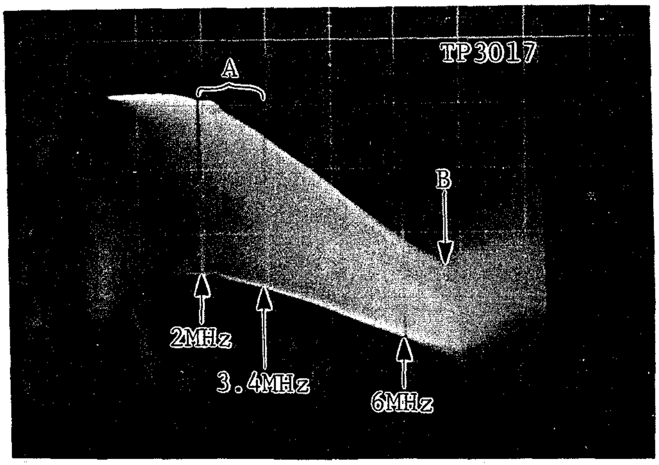


Fig. E19 0.5V/2msec. div.

4-12. Confirmation/Adjustment of Comb Filter

Test Point : TP3301
Adjustment : R3342 (COMB BAL)

1. Place the unit in STOP mode.
2. Connect the jumper between TP3317 and TP3022.
3. Set the Signal Select Button on the sweep generator to "CHROMA" position and turn the Sync, Burst, and Set-Up to off.
4. Supply the output of the sweep generator to TP3303, and connect the scope to TP3301.
5. Set the sweep generator output level to 1.2Vp-p and put the markers on 3.08MHz, 3.58MHz and 4.08MHz portions.
6. Confirm that the carrier learkage "A" at 3.58MHz portion is minimum.
7. If "A" is not minimum, adjust COMB BAL R3342 so that the level of "A" becomes minimum as shown below.

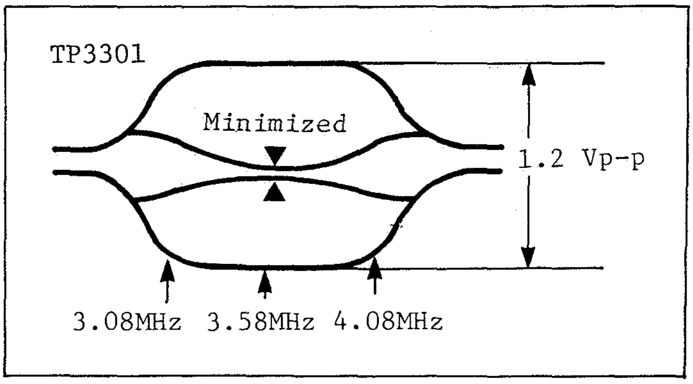


Fig. E20 0.2V/1msec. div.

4-13. Playback Level Adjustment

Test Point: TP3019
Adjustments: R3186 (PB C)
R3163 (PB LEV)

1. Supply a color bar signal to the VIDEO INPUT on the rear panel and make a short recording.
2. Connect a scope to TP3019.
3. Playback the just recorded portion.
4. Adjust PB LEV R3163 so that the level becomes 2.0±0.05Vp-p.
5. Adjust PB C R3186 so that the level becomes 1.2±0.06Vp-p.

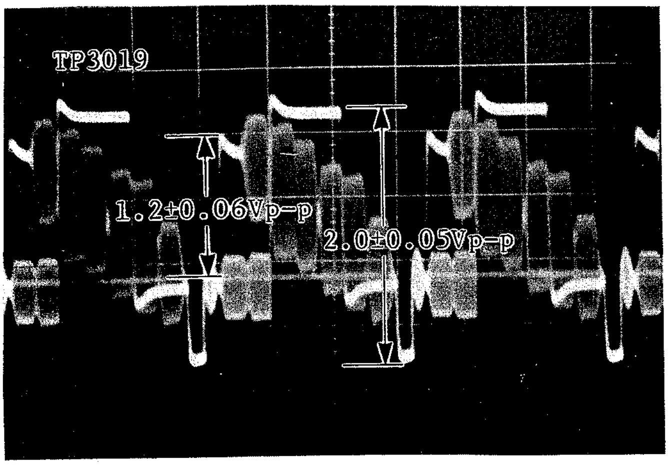


Fig. E21 0.5V/20μsec.μdiv.

5. Audio Section

Note:
Unless otherwise specified, all test points and controls are located on the Audio (1) C.B.A. and Audio (2) C.B.A.

5-1. Audio Playback Frequency Characteristic Adjustments

Test Points: TP4001, TP4002
Adjustments: R4030 (P.B. FREQ. CH1)
R4107 (P.B. FREQ. CH2)

1. Set the DOLBY NR switch to OFF.
2. Confirm that P.B. CH1 (R4033) and P.B. CH2 (R4110) on the Audio (1) C.B.A. are set to center position.
3. Connect a scope to TP4001 on the Audio (1) C.B.A.
4. Insert the alignment tape VFM8080H2 and playback the audio 1kHz (Multi-burst) and 6kHz (Monoscope).
5. Adjust P.B. FREQ. CH1 R4030 on the Audio (1) C.B.A. so that the audio 1kHz and 6kHz become same level.
6. Change the probe to TP4002 on the Audio (1) C.B.A.
7. Adjust P.B. FREQ. CH2 R4107 on the Audio (1) C.B.A. so that the audio 1kHz and 6kHz become same level.

5-2. Audio Playback Gain Adjustment

Test Points: TP4001, TP4002
Adjustments: R4033 (PB CH1)
R4110. (PB CH2)

1. Connect a scope to TP4001 on the Audio (1) C.B.A.
2. Insert the alignment tape VFM8080H2 and playback the multi-burst portion.
3. Adjust PB CH1 R4033 on the Audio (1) C.B.A. so that the level becomes 1.2Vp-p.
4. Change the probe to TP4002 on the Audio (1) C.B.A.
5. Adjust PB CH2 R4110 on the Audio (1) C.B.A. so that the level becomes 1.2Vp-p.

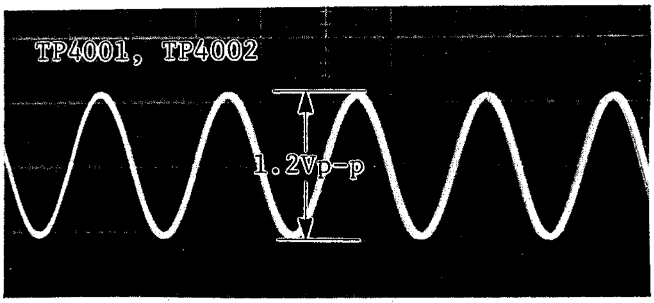


Fig. E22 0.5V/0.5msec. div.

5-3. Audio Bias Current Adjustment

Test Point: A/C Head
Adjustments: R4351 (BIAS1),
R4352 (BIAS2)

1. Do not supply any audio signal to AUDIO INPUT.
2. Connect VTVMs to A/C Head as shown in Fig. E23.

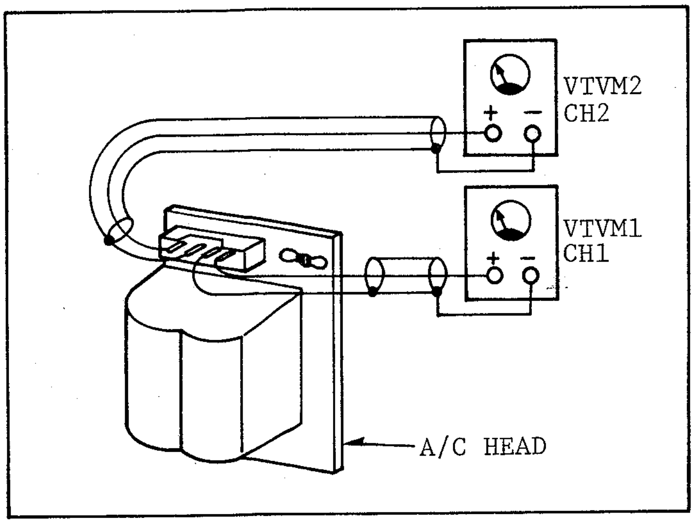


Fig. E23

3. Adjust BIAS1 R4351 and BIAS2 R4352 on the Audio (1) C.B.A. so that both VTVM indicate 2.2 ± 2mVrms.

5-4. Audio REC Current Adjustment

Test Points: TP4003, TP4004, LINE OUT
Adjustments: R4086 (REC CURR1)
R4160 (REC CURR2)

1. Connect VTVMs to the deck as shown in Fig. E24.

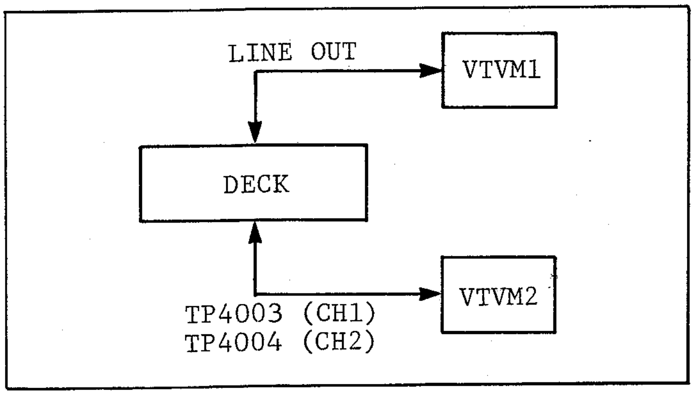


Fig. E24

2. Supply a sine wave signal at -20dB, 1kHz to the Line Inputs on the rear panel.
3. Adjust the AUDIO LEVELs on the front panel so that the VTVM1 indicates 500mVrms.
4. Set the unit in REC mode.
5. Adjust REC CURR1 R4086 (REC CURR2 R4160) so that the VTVM2 indicates 450mVrms. Then determine this level as 0dB.
6. Playback the just recorded portion and confirm that the VTVM1 indicates 0dB.
7. If the VTVM2 does not indicate 0dB, repeat steps 4 to 6 until that the VTVM1 and VTVM2 indicate same level.

5-5. Time Code meter Adjustment

Test Point: CH2 LEVEL METER
Adjustment: R4254 (TC METER)

1. Set the TC/AUDIO CH2 switch on the rear panel to TC side.
2. Supply a sinewave signal at 2kHz, 1Vp-p to the TIME CODE INPUT on the rear panel.
3. Set the unit in REC mode.
4. Confirm that the Time Code lamp on the front panel turns on.
5. Adjust TC METER (R4254) on the Audio (2) C.B.A. so that the CH2 LEVEL METER indicates 0VU.

5-6. Audio Pre-Amp. P.C.Board Adjustment

Test Points : AUDIO OUT
(NORM/HD)
Adjustments : R4407 (LINE CH1)
R4403 (LINE CH2)
R4410 (Hi-Fi CH1)
R4406 (Hi-Fi CH2)

1. Set the AUDIO MONITOR switch on the front panel to "NORM" position, and all of audio level volumes on the same panel to "FIX" position.
2. Supply a sinewave signal at 1kHz, -8dB to both channels of NORM AUDIO IN jacks on the rear panel.
3. Connect VTVMs to both channels of AUDIO OUT jacks on the rear panel.

4. Adjust LINE CH1 and LINE CH2 R4407 and R4403 both on the Audio Pre-Amp P.C.Board so that the output levels become -7.5dB±0.2.
5. Change the AUDIO MONITOR switch from "NORM" to "HD/AUTO" position.
6. Adjust Hi-Fi CH1 and Hi-Fi CH2 R4410 and R4406 both on the same board so that the output levels become -7.5dB±0.2.

5-7. Audio Meter Adjustment

Test Points : AUDIO LEVEL Meter
Adjustments : R4105 (CH1 METER)
R4112 (CH2 METER)

1. Set the all of audio level volumes on the front panel to "FIX" position.
2. Supply a sinewave signal at 1kHz, 0dB to the AUDIO IN jacks on the rear panel, and set the METER select switch on the front panel to "HD" position.
3. Looking at the AUDIO LEVEL meters on the front panel, adjust CH1 METER and CH2 METER R4105 and R4112 both on the Audio Control P.C.Board so that the CH1 and CH2 level meter indicate at -5dB.

6. Hi-Fi Audio Section

Note:
- (1). Unless otherwise specified, all test points and controls are located on the Hi-Fi Audio C.B.A.
- (2). Set the AUDIO MONITOR and AUDIO REC switches are as follows;
  AUDIO MONITOR switch : "MIX"
  AUDIO REC switch : "ON"

6-1. 60° Head Switching Shifter Adjustment

Test Points : TP4307, TP4308
Adjustments : R4540 (60° SHIFT 1)
R4539 (60° SHIFT 2)

1. Connect the scope CH1 to TP4308 and CH2 to TP4307.
2. Playback the alignment tape (VFM8080H2) and adjust 60° SHIFT 1 R4540 so that the period "T" becomes 5.55±0.1msec as shown below.

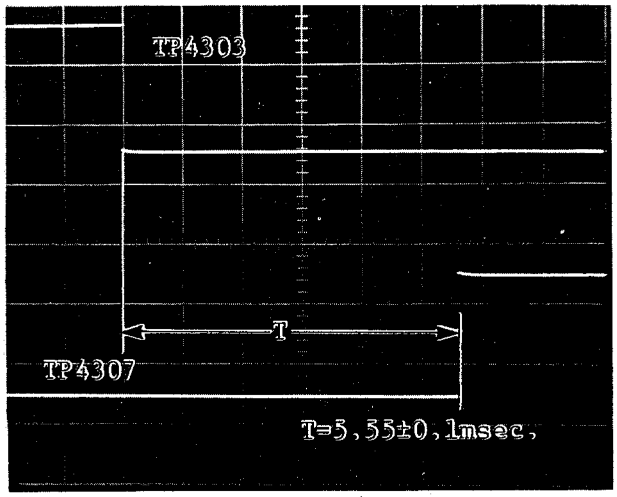


Fig. E25 UP :2V/1msec.div.
DOWN :2V1msec.div.

3. Change the triggering slope of the scope from "+" to "-" side, and adjust 60° SHIFT 2 R4539 so that the difference between the rising and falling edges becomes ±60μsec.

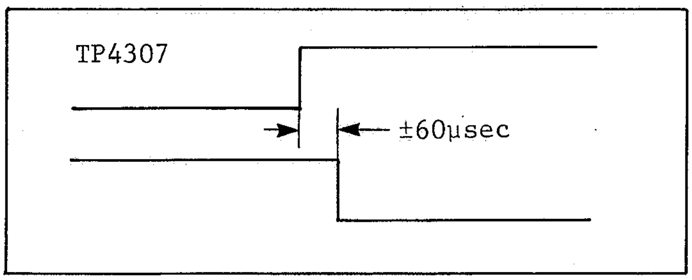


Fig. E26.

6-2. FM carrier Frequency Adjustment

Test Points : TP4304, TP4306
Adjustments : R4366 (fL CARRIER)
R4522 (fR CARRIER)

1. Place the unit to the STOP mode, and connect the frequency counter to TP4304.
2. Adjust fL CARRIER R4366 so that the indication of frequency counter becomes 1.3MHz±10kHz.
3. Change the probe of frequency counter from TP4304 to TP4306, and adjust fF CARRIER R4522 so that the indication of frequency counter becomes 1.7MHz ± 10kHz.

6-3. FM Deviation Adjustment

Test Points : TP4304, TP4306
Adjustments : R4369 (fL DEV)
R4528 (fR DEV)

1. Place the unit in the STOP mode, and supply sinewave signal at 1kHz, -8dB to the Line Input on the rear panel.
2. Connect the spectrum analyzer to TP4304, and set the center frequency of spectrum analyzer at 1.3MHz portion.
3. Adjust fL DEV R4369 so that the width of "fw" portion becomes 100kHz ±5kHz.

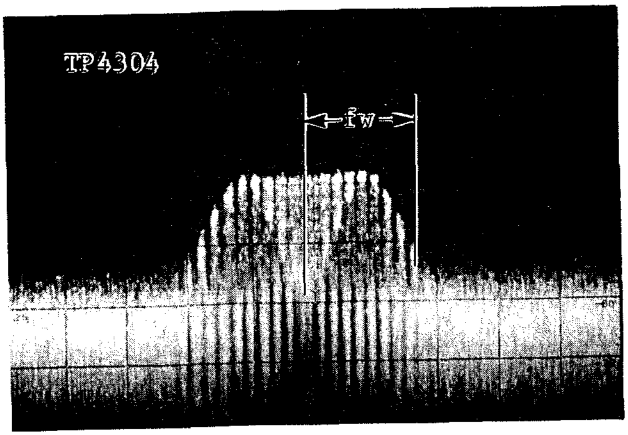


Fig. E27.

4. Change the probe of spectrum analyzer from TP4304 to TP4306, and set the center frequency of spectrum analyzer to 1.7MHz portion.

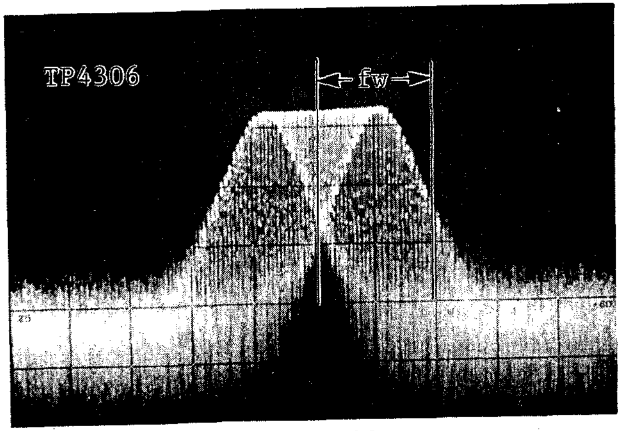


Fig. E28

5. Adjust fR DEV R4528 so that the width of "fw" portion becomes 100kHz ± 5kHz.

6-4. Hi-Fi Audio Recording Current Adjustment

Test Points : TP4309 (HOT), TP4310 (GND)
Adjustments : R4371 (fL REC CURR.)
R4534 (fR REC CURR.)

1. Connect the jumper wire between pins (1), (2) and (3) of connector P6663, and turn the control R4371 fully counter clockwise.
2. Place the unit in REC/PLAY mode, and connect the scope between TP4309(HOT) and TP4310(GND).
3. Adjust fR REC CURR. R4534 so that the amplitude of waveform becomes 150mV ±10mV.

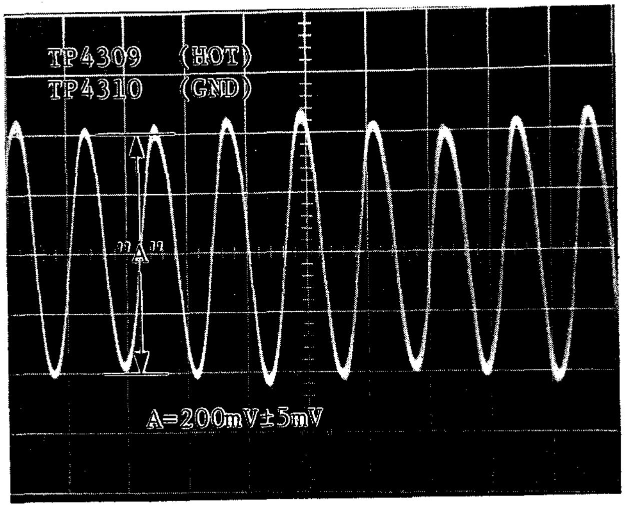


Fig. E29 50mV/0.5μsec.div.

4. Adjust fL REC CURR. R4371 so that the amplitude of waveform becomes 190mV ± 10mV.

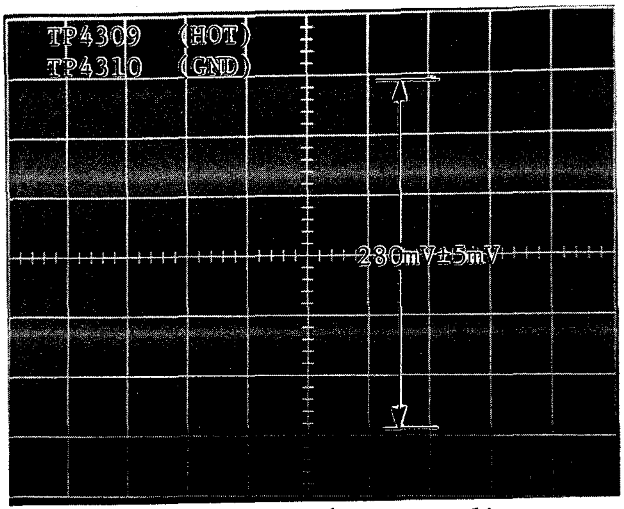


Fig. E30 50mV/0.2msec.div.

5. Remove the jumper wire.

6-5. Hi-Fi Audio Head Amp Mix Balance Adjustment

Test Points : TP4314, TP4315
Adjustments : R4404 (BALANCE)

1. Connect the jumper wire between pins (1), (2) and (3) of connector P6663.
2. Insert the cassette tape, and make a recording for a few minites.
3. Connect the scope CH1 to TP4314, and playback the just recorded portions.
4. Adjust BALANCE R4404 so that the "A" and "B" portions become same level, and they are more than 400mV.

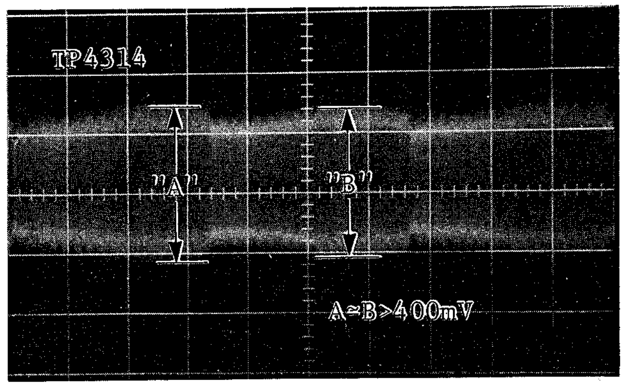


Fig. E31 0.2V/5msec.div.

5. Change the probe of scope from TP4314 to TP4315, and confirm that the ratio of A and B is to meet spec..
   Specification : A/B = 1 ± 0.3
   (A,B : more than 400mV)

6-6. Hi-Fi Audio Noise Reduction (IC4309) Timing Current Adjustment

Test Points : TP4312 (GND), TP4313 (HOT)
Adjustment : R4471 (TIMING)

1. Do not supply any audio signal to the Line Input and place the unit in the STOP mode.
2. Connect the VTVM between TP4312 (GND) and TP4313(HOT).
3. Adjust TIMING, R4471 so that the indication of VTVM becomes 15±0.15mV.

6-7. Audio Muting Level Adjustment

Test Points : HD OUT
Adjustments : R4442 (fL MUT)
R4545 (fR MUT)

1. Connect the scope CH1 to TP4314 and CH2 to TP4315.
2. Playback the alignment tape (VFJ 8002HMF), and pre-adjust the TRACKING VR on the front panel so that the envelope levels of both waveforms are 80mVp-p as shown below.

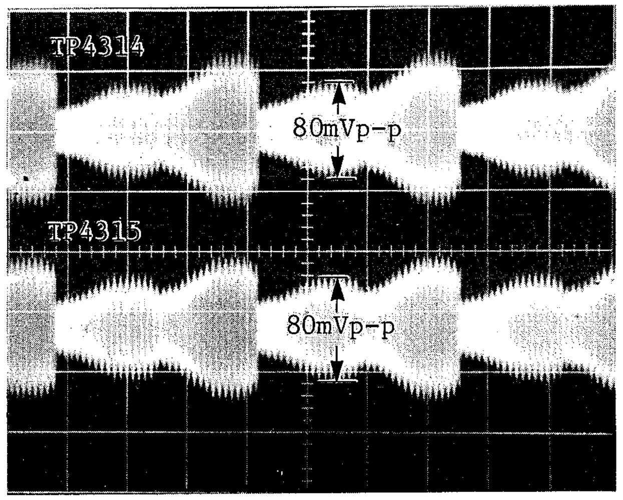
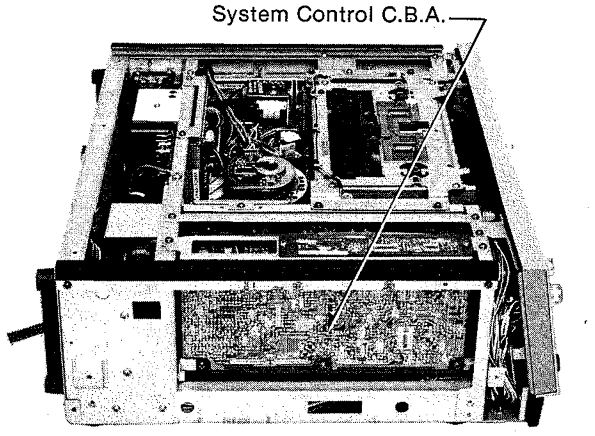


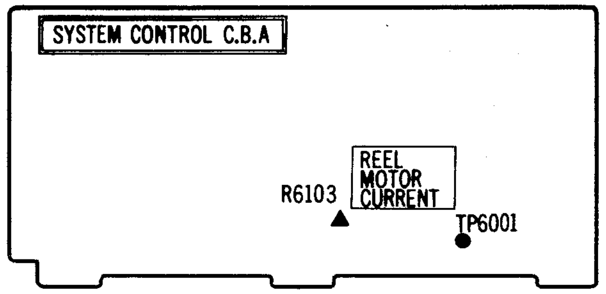
Fig. E32 0.1V/10msec.div.

3. Turn the R4442 fully counter clockwise and R4545 fully clockwise.
4. Reinstall the alignment tape, and install the blank cassette tape. (any audio signal does not recorded)
5. Adjust fL MUT and fR MUT R4442 and R4545 so that the audio monitor signal at HD OUT becomes muting off.

System Control C.B.A.

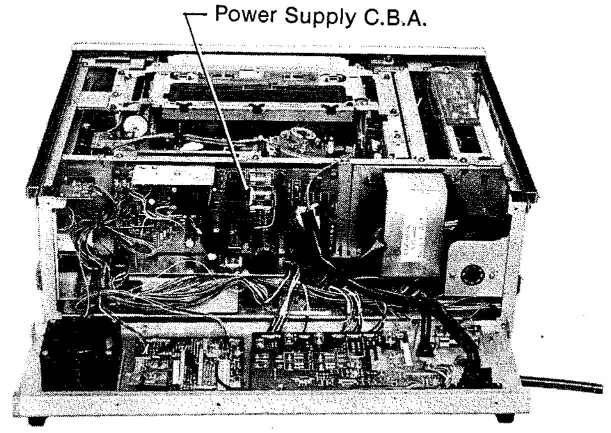
(VEP06190A1)

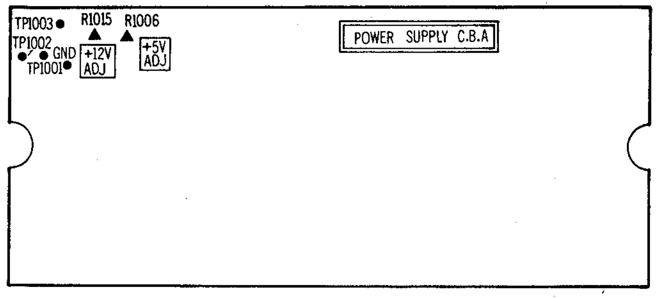

System Control C.B.A.


SYSTEM CONTROL C.B.A
REEL MOTOR CURRENT
R6103
TP6001

Power Supply C.B.A.

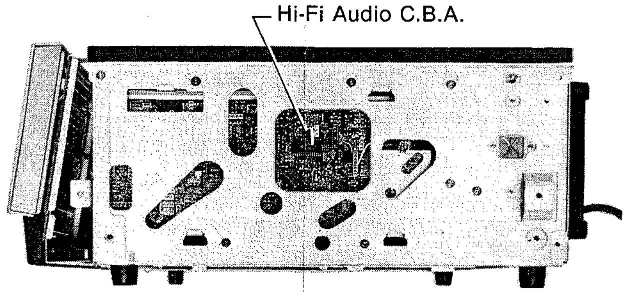
(VEP01122B1)

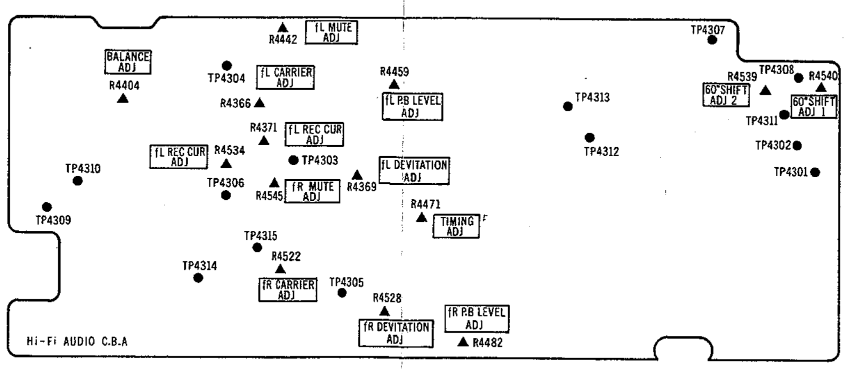

Power Supply C.B.A.


TP1003
R1015
R1006
TP1002
GND
TP1001
+12V ADJ
+5V ADJ
POWER SUPPLY C.B.A

Hi-Fi Audio C.B.A.

(VEP0482B1)

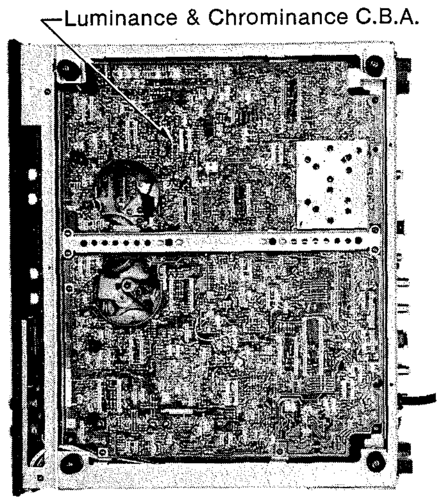

Hi-Fi Audio C.B.A.

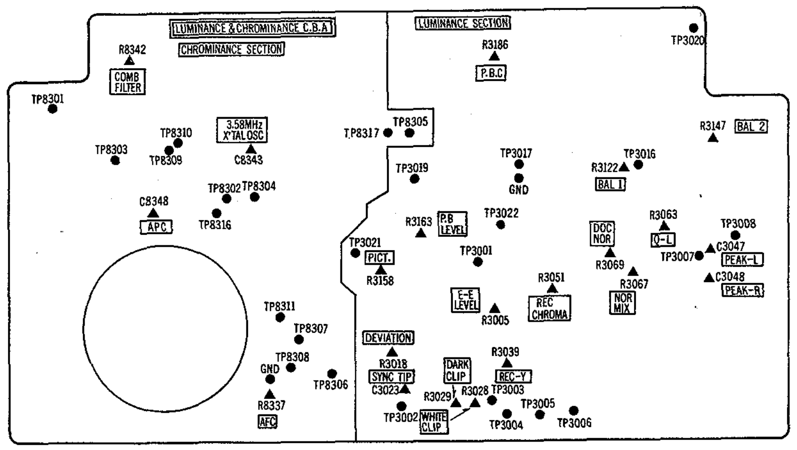

R4442
fL MUTE ADJ
BALANCE ADJ
R4404
TP4304
fL CARRIER ADJ
R4366
R4459
fL P.B LEVEL ADJ
R4371
fL REC CUR ADJ
fL REC CUR ADJ
R4534
TP4303
TP4310
TP4306
R4545
fR MUTE ADJ
R4369
fL DEVITATION ADJ
TP4309
R4471
TIMING ADJ
TP4315
R4522
TP4314
fR CARRIER ADJ
TP4305
R4528
fR DEVITATION ADJ
fR P.B LEVEL ADJ
R4482
TP4313
TP4312
TP4307
R4539
TP4308
R4540
60°SHIFT ADJ 2
60°SHIFT ADJ 1
TP4311
TP4302
TP4301
Hi-Fi AUDIO C.B.A

Location of Test Points & Controls

Luminance & Chrominance C.B.A.

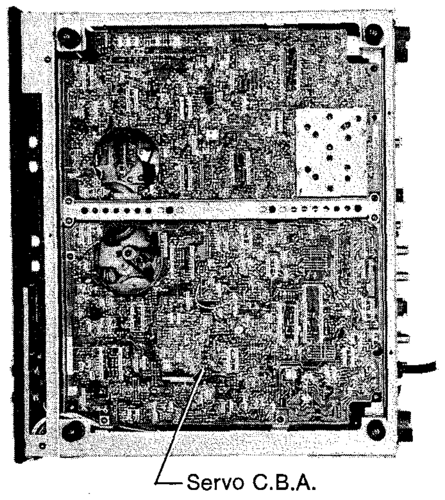
(VEP03164E)

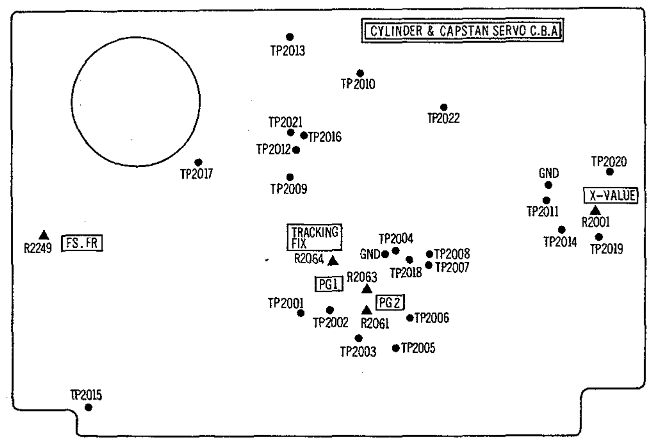

Luminance & Chrominance C.B.A.


LUMINANCE & CHROMINANCE C.B.A
CHROMINANCE SECTION
R8342
COMB FILTER
TP8301
TP8310
TP8303
TP8309
3.58MHz X'TAL OSC
C8343
TP8302
TP8304
C8348
APC
TP8316
TP8311
TP8307
TP8308
GND
TP8306
R8337
AFC
LUMINANCE SECTION
R3186
P.B.C
TP3020
TP8317
TP8305
R3147
BAL 2
TP3019
TP3017
GND
R3122
TP3016
BAL 1
R3163
P.B LEVEL
TP3022
TP3021
PICT.
R3158
TP3001
DOC NOR
R3069
R3063
Q-L
TP3008
TP3007
C3047
PEAK-L
C3048
PEAK-R
E-E LEVEL
R3005
R3051
REC CHROMA
R3067
NOR MIX
DEVIATION
R3018
SYNC TIP
C3023
DARK CLIP
R3039
REC-Y
R3029
R3028
TP3003
TP3002
WHITE CLIP
TP3004
TP3005
TP3006

Servo C.B.A.

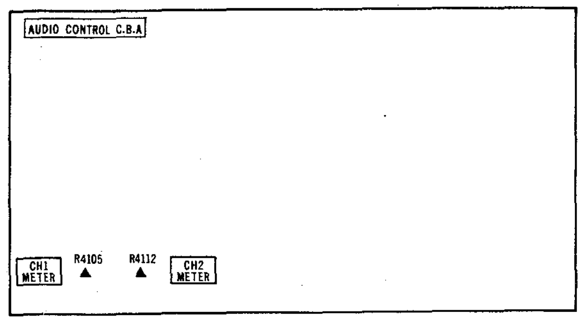
(VEP02164D)




CYLINDER & CAPSTAN SERVO C.B.A
TP2013
TP2010
TP2022
TP2021
TP2016
TP2012
TP2017
TP2009
GND
TP2020
X-VALUE
TP2011
R2001
TP2014
TP2019
R2249
FS.FR
TRACKING FIX
R2064
TP2004
GND
TP2008
TP2007
TP2018
R2063
PG1
PG2
TP2001
TP2002
R2061
TP2006
TP2003
TP2005
TP2015

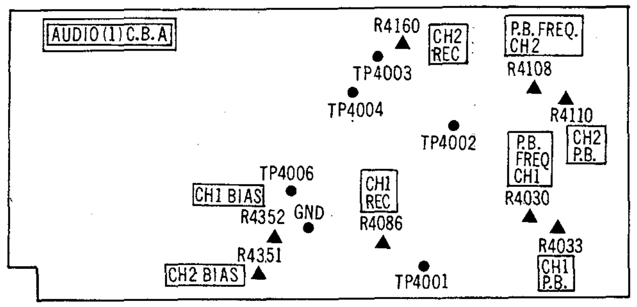
Audio Control C.B.A.

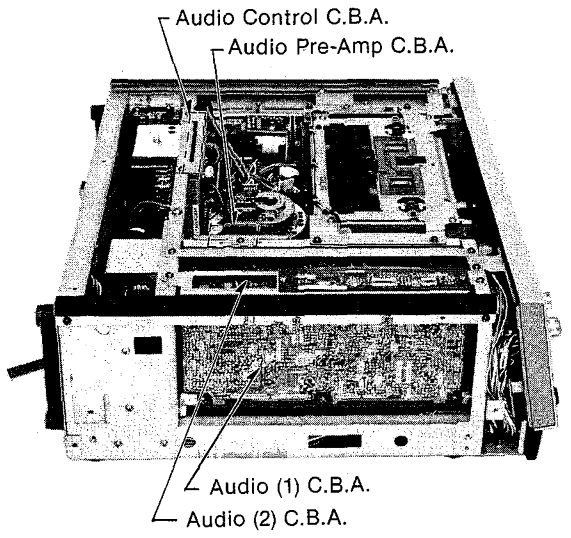
(VEP04098A1)


AUDIO CONTROL C.B.A
CH1 METER
R4105
R4112
CH2 METER

Audio (1) C.B.A.

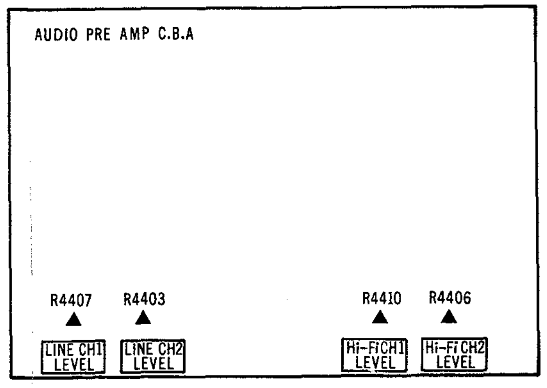
(VEP04093F)


AUDIO (1) C.B.A
R4160
CH2 REC
P.B. FREQ. CH2
TP4003
R4108
TP4004
R4110
TP4002
P.B. FREQ CH1
CH2 P.B.
TP4006
CH1 BIAS
CH1 REC
R4030
R4352
GND
R4086
R4033
R4351
CH2 BIAS
TP4001
CH1 P.B.


Audio Control C.B.A.
Audio Pre-Amp C.B.A.
Audio (1) C.B.A.
Audio (2) C.B.A.

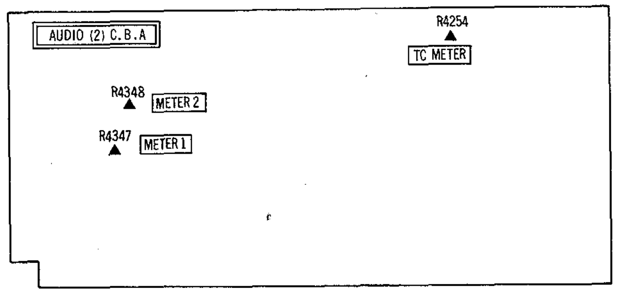
Audio Pre-Amp C.B.A.

(VEP04099A1)


AUDIO PRE AMP C.B.A
R4407
R4403
R4410
R4406
LINE CH1 LEVEL
LINE CH2 LEVEL
Hi-Fi CH1 LEVEL
Hi-Fi CH2 LEVEL

Audio (2) C.B.A.

(VEP04094F)


AUDIO (2) C.B.A
R4254
TC METER
R4348
METER 2
R4347
METER 1

ORDER NO. VRD-8310-493

Service Manual

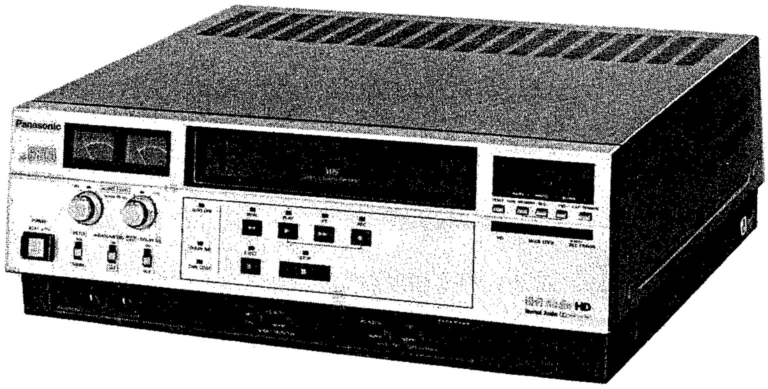
Video Cassette Recorder

Vol. 3

Panasonic
Omnivision II VHS Hi-Fi

AG-6800

Block Diagrams



SPECIFICATIONS

Power Source;	110/120/220/240 V AC, 60/50 Hz
Power Consumption:	Approx. 60 watts
Television System:	EIA Standard (525 lines, 60 fields) NTSC color signal
Video Recording System:	2 rotary heads, helical scanning system Luminance: FM azimuth recording Color signal: converted subcarrier phase shift recording
Audio Tracks:	4 channels NORMAL (CH1/CH2): 2 fixed head tracks HD (CH1/CH2): 2 rotary head tracks
Tape Format:	Tape width 1/2 inch (12.7 mm), high density tape
Tape Speed:	1-5/16 i.p.s. (33.35 mm/s) (Normal)
Record/Playback Time:	120 min. with NV-T120
FF/REW Time:	Less than 4.0 min with NV-T120
Input Level:	Video: VIDEO IN (BNC), 1.0 Vp-p, 75 Ω Audio: LINE IN (RCA); NORMAL (CH1/CH2) −20 dB (standard input −8 dB), 47 kΩ HD (CH1/CH2)
Output Level:	Video: TV Monitor (8 pins), 1.0 Vp-p, 75 Ω VIDEO OUT (BNC), 1.0 Vp-p, 75 Ω Audio: TV Monitor (8 pins), 0 dB, 600 Ω AUDIO OUT (RCA); NORMAL (CH1/CH2) −8 dB, 1 kΩ HD (CH1/CH2) HEADPHONES, −16 dB ~ −60 dB, 8 Ω
Rec Remote:	(RCA)
Camera Remote:	(M2)
Video Horizontal Resolution:	Color: more than 240 lines B/W: more than 300 lines (on monoscope test pattern)
Audio Frequency Response:	50 ~ 12,000 Hz (Normal Audio) 20 ~ 20,000 Hz (HD Sound)
Signal-to-Noise Ratio:	Video: B/W: better than 46 dB Color: better than 45 dB (Shibasoku noise meter) Audio: better than 48 dB (Normal Audio/ Dolby NR IN)
Audio Dynamic Range:	better than 80 dB (HD Sound)
Wow and Flutter:	less than 0.005% (HD Sound)
Operating Temperature:	41°F ~ 104°F (5°C ~ 40°C)
Operating Humidity:	35% ~ 80%
Weight:	30.9 lbs (14.0 kg)
Dimensions:	17″(W) × 15-1/2″(D) × 6-1/4″(H) 430(W) × 392(D) × 158(H) mm
Accessory Supplied:	1 pc. Dust cover

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

* Noise reduction manufactured under license from Dolby Laboratories Licencing Corporation.

Panasonic®

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CONTENTS

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SYSTEM CONTROL (2) BLOCK DIAGRAM 3-3

LUMINANCE & CHROMINANCE BLOCK DIAGRAM 3-4

CYLINDER & CAPSTAN SERVO BLOCK DIAGRAM 3-5

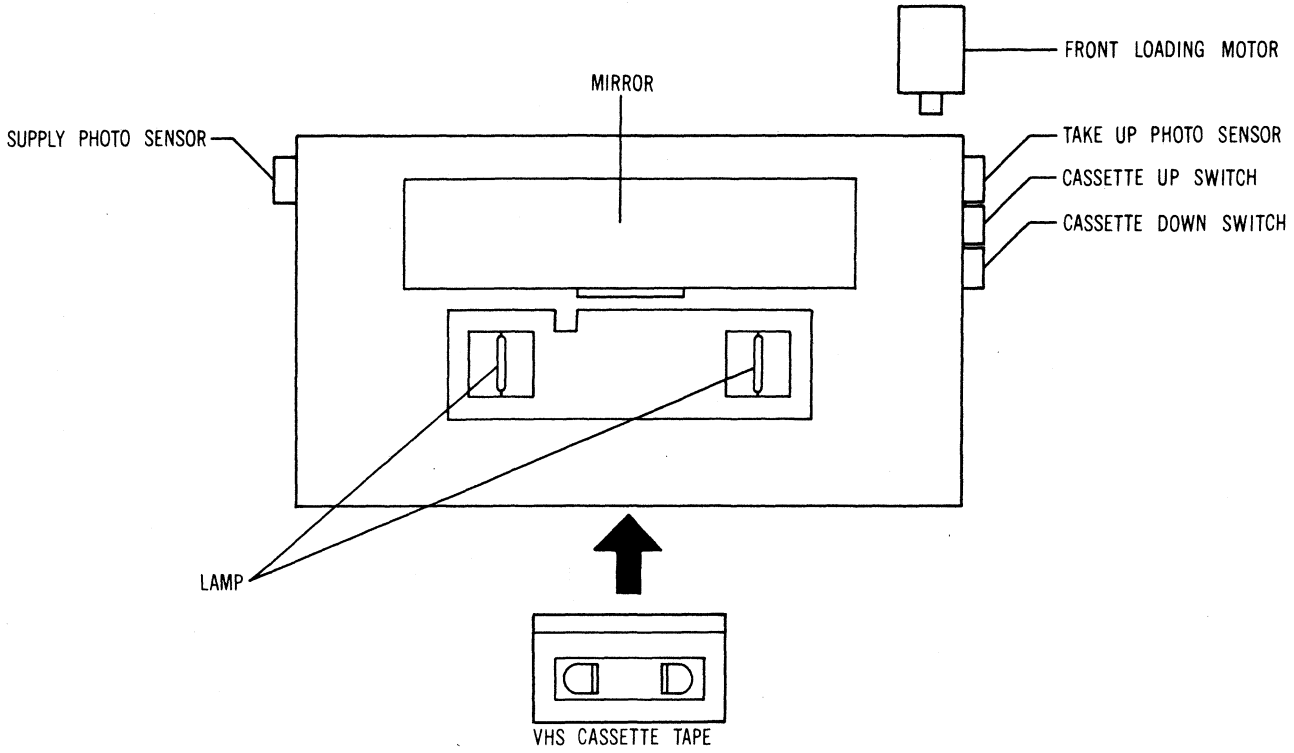
AUDIO OVERALL BLOCK DIAGRAM 3-6

Hi-Fi AUDIO BLOCK DIAGRAM 3-6

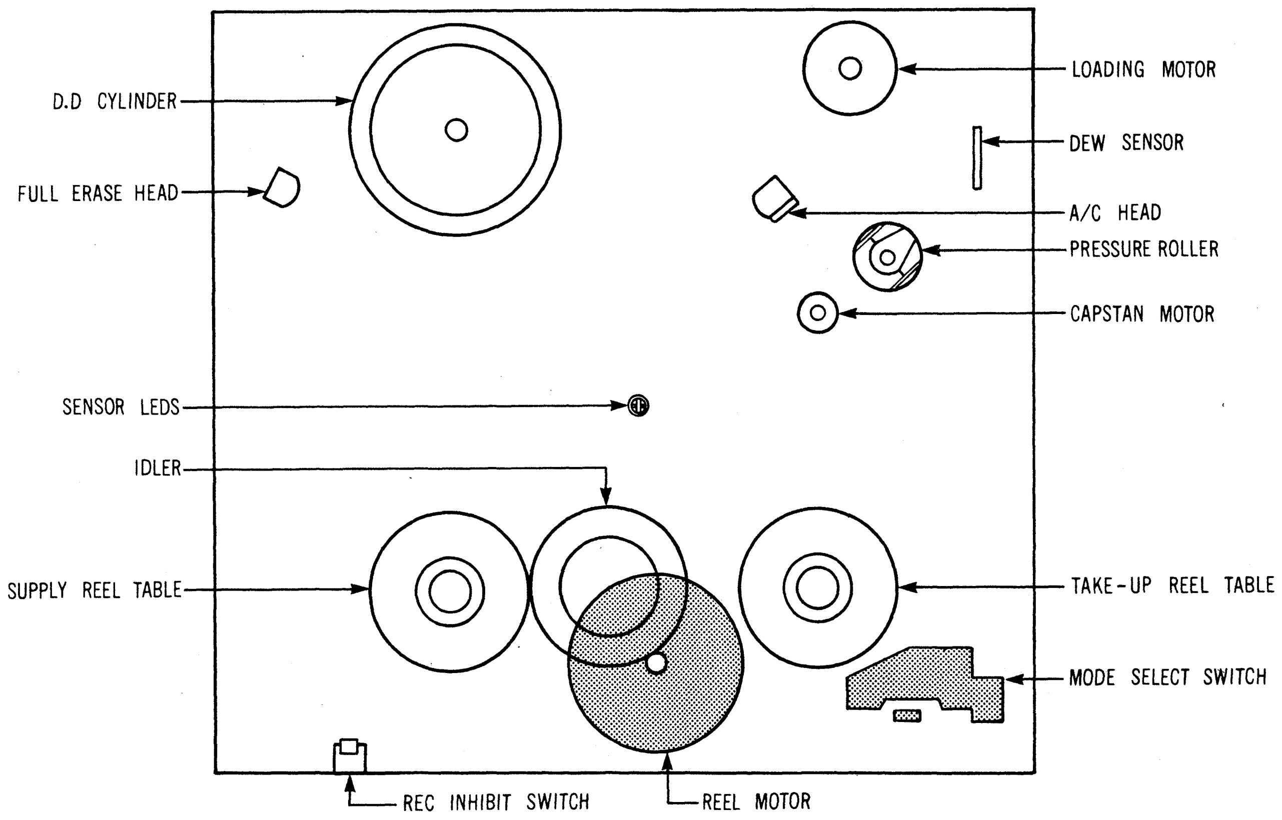
AUDIO BLOCK DIAGRAM 3-7

Location of Test Points & Controls 3-8

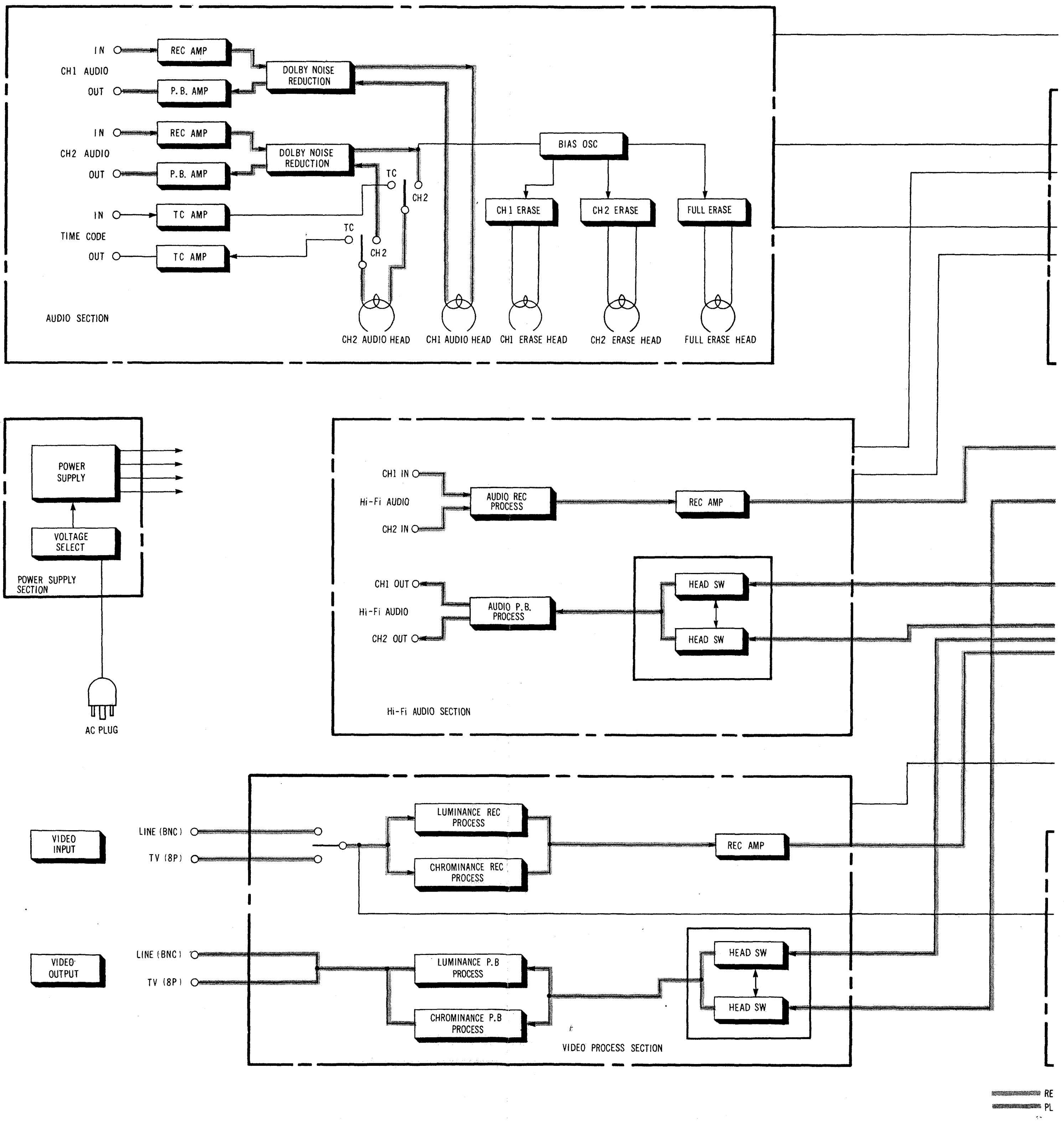
MAJOR FRONT LOADING ELEMENTS


FRONT LOADING MOTOR
MIRROR
SUPPLY PHOTO SENSOR
TAKE UP PHOTO SENSOR
CASSETTE UP SWITCH
CASSETTE DOWN SWITCH
LAMP
VHS CASSETTE TAPE

MAJOR TRANSPORT ELEMENTS


D.D CYLINDER
LOADING MOTOR
DEW SENSOR
FULL ERASE HEAD
A/C HEAD
PRESSURE ROLLER
CAPSTAN MOTOR
SENSOR LEDS
IDLER
SUPPLY REEL TABLE
TAKE-UP REEL TABLE
MODE SELECT SWITCH
REC INHIBIT SWITCH
REEL MOTOR

OVERALL BLOCK DIAGRAM


IN
CH1 AUDIO
OUT
REC AMP
P.B. AMP
DOLBY NOISE REDUCTION
IN
CH2 AUDIO
OUT
REC AMP
P.B. AMP
DOLBY NOISE REDUCTION
TC
CH2
BIAS OSC
IN
TIME CODE
OUT
TC AMP
TC AMP
TC
CH2
CH1 ERASE
CH2 ERASE
FULL ERASE
AUDIO SECTION
CH2 AUDIO HEAD
CH1 AUDIO HEAD
CH1 ERASE HEAD
CH2 ERASE HEAD
FULL ERASE HEAD
POWER SUPPLY
VOLTAGE SELECT
POWER SUPPLY SECTION
AC PLUG
CH1 IN
Hi-Fi AUDIO
CH2 IN
AUDIO REC PROCESS
REC AMP
CH1 OUT
Hi-Fi AUDIO
CH2 OUT
AUDIO P.B. PROCESS
HEAD SW
HEAD SW
Hi-Fi AUDIO SECTION
VIDEO INPUT
LINE (BNC)
TV (8P)
LUMINANCE REC PROCESS
CHROMINANCE REC PROCESS
REC AMP
VIDEO OUTPUT
LINE (BNC)
TV (8P)
LUMINANCE P.B PROCESS
CHROMINANCE P.B PROCESS
HEAD SW
HEAD SW
VIDEO PROCESS SECTION
RE
PL

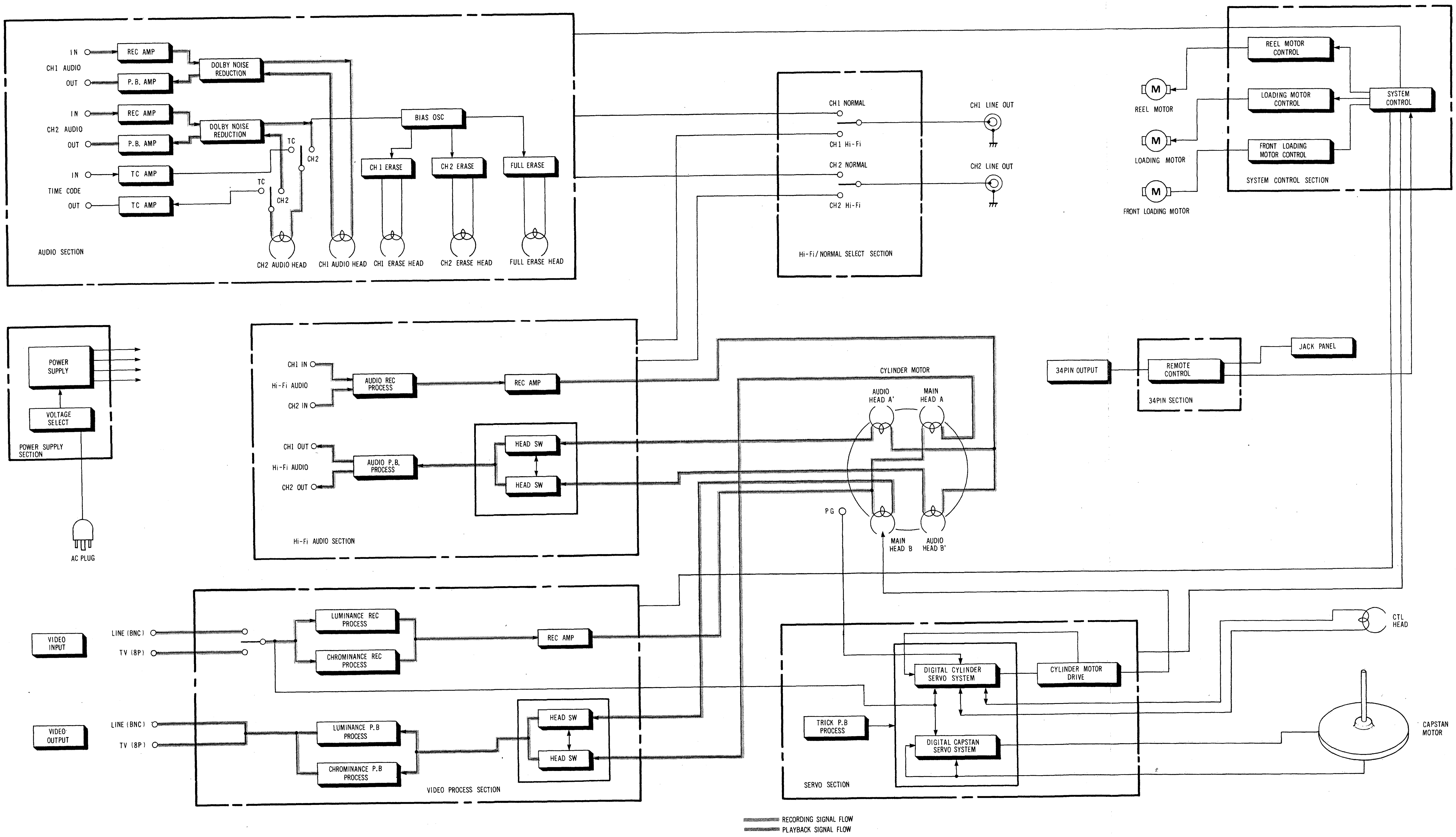
IN_ MOTOR

IOT SENSOR

P SWITCH

OW SWITCH

OVERALL BLOCK DIAGRAM


IN
CH1 AUDIO
OUT
REC AMP
P. B. AMP
DOLBY NOISE REDUCTION
IN
CH2 AUDIO
OUT
REC AMP
P. B. AMP
DOLBY NOISE REDUCTION
IN
TIME CODE
OUT
TC AMP
TC AMP
TC
CH2
TC
CH2
BIAS OSC
CH 1 ERASE
CH 2 ERASE
FULL ERASE
CH2 AUDIO HEAD
CH1 AUDIO HEAD
CH1 ERASE HEAD
CH2 ERASE HEAD
FULL ERASE HEAD
AUDIO SECTION
CH1 NORMAL
CH1 Hi-Fi
CH2 NORMAL
CH2 Hi-Fi
Hi-Fi / NORMAL SELECT SECTION
CH1 LINE OUT
CH2 LINE OUT
REEL MOTOR CONTROL
LOADING MOTOR CONTROL
FRONT LOADING MOTOR CONTROL
SYSTEM CONTROL
SYSTEM CONTROL SECTION
M
REEL MOTOR
M
LOADING MOTOR
M
FRONT LOADING MOTOR
POWER SUPPLY
VOLTAGE SELECT
POWER SUPPLY SECTION
AC PLUG
CH1 IN
Hi-Fi AUDIO
CH2 IN
AUDIO REC PROCESS
REC AMP
CH1 OUT
Hi-Fi AUDIO
CH2 OUT
AUDIO P.B. PROCESS
HEAD SW
HEAD SW
Hi-Fi AUDIO SECTION
CYLINDER MOTOR
AUDIO HEAD A'
MAIN HEAD A
PG
MAIN HEAD B
AUDIO HEAD B'
34PIN OUTPUT
REMOTE CONTROL
34PIN SECTION
JACK PANEL
VIDEO INPUT
LINE (BNC)
TV (8P)
LUMINANCE REC PROCESS
CHROMINANCE REC PROCESS
REC AMP
VIDEO OUTPUT
LINE (BNC)
TV (8P)
LUMINANCE P.B PROCESS
CHROMINANCE P.B PROCESS
HEAD SW
HEAD SW
VIDEO PROCESS SECTION
TRICK P.B PROCESS
DIGITAL CYLINDER SERVO SYSTEM
CYLINDER MOTOR DRIVE
DIGITAL CAPSTAN SERVO SYSTEM
SERVO SECTION
CTL HEAD
CAPSTAN MOTOR
RECORDING SIGNAL FLOW
PLAYBACK SIGNAL FLOW

M OR

SOR

ROLLER

M OR

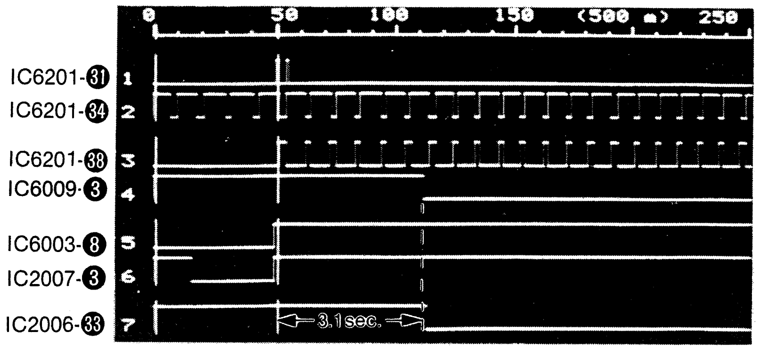
REEL TABLE

ECT SWITCH

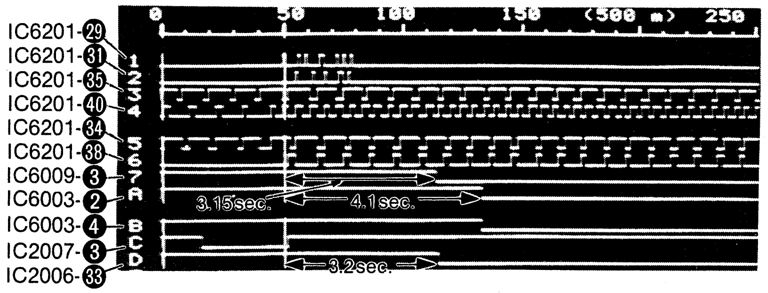
SYSTEM CONTROL (1) BLOCK DIAGRAM

• MODE BY MODE TIMING CHARTS

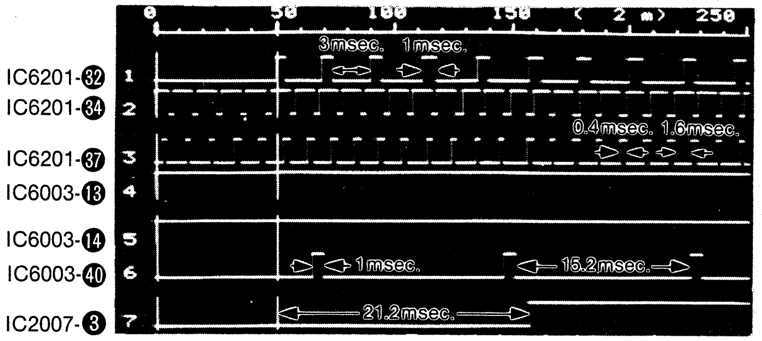
Ⓐ PLAY MODE



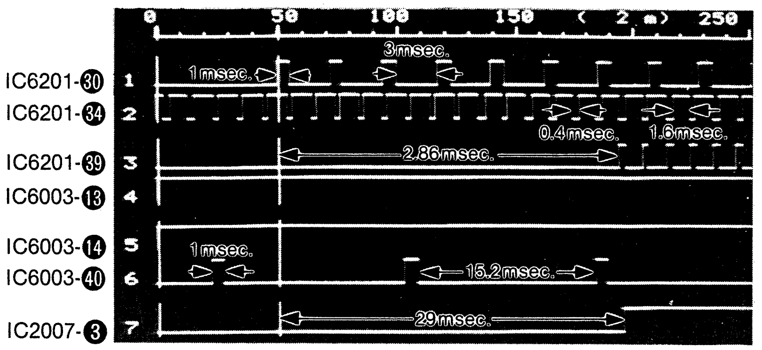
Ⓑ REC/PLAY MODE

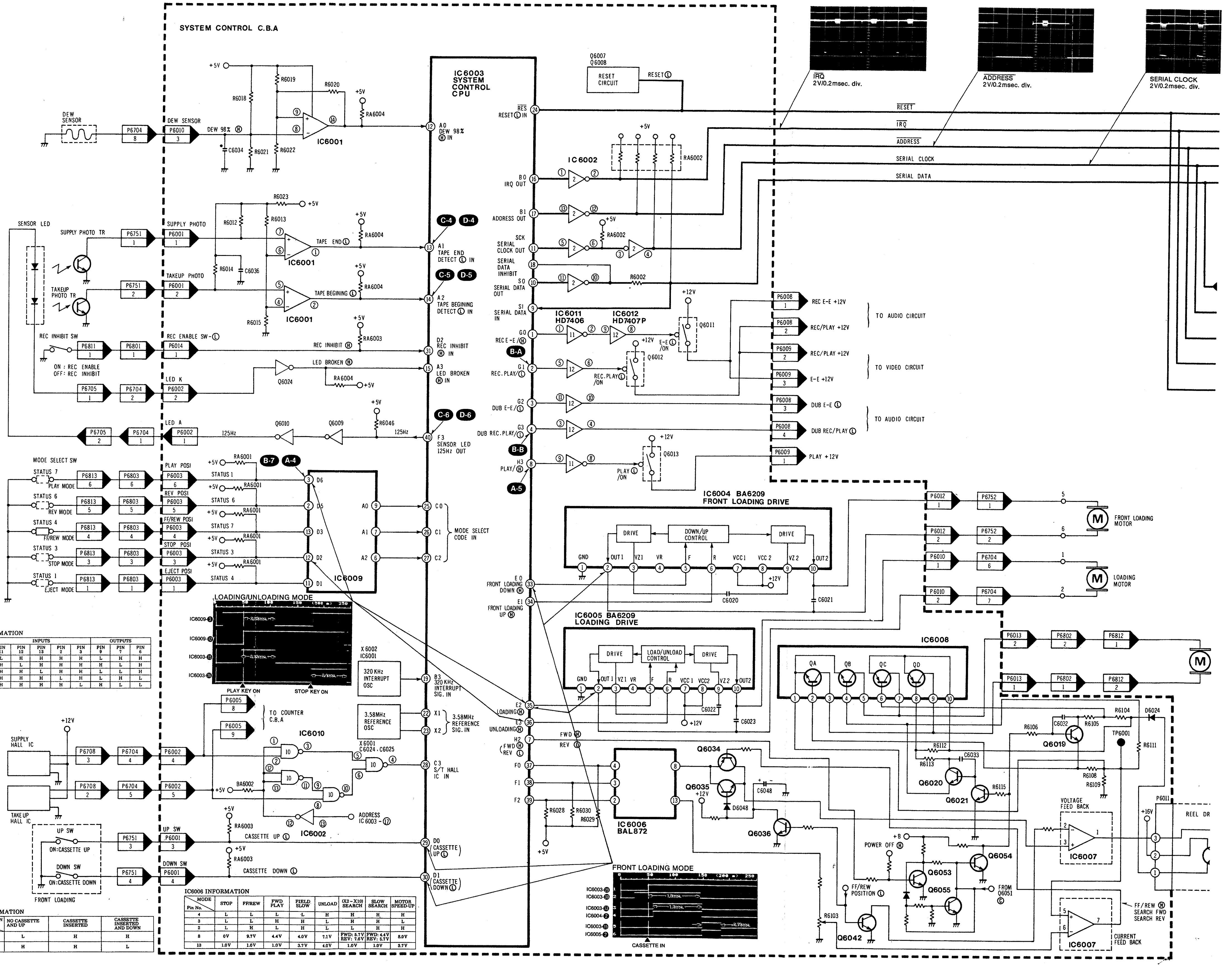


Ⓒ FF MODE



Ⓓ REW MODE





SYSTEM CONTROL C.B.A
DEW SENSOR
P6704 8
P6010 3
DEW SENSOR
DEW 98% Ⓗ
R6018
R6019
R6020
R6021
R6022
C6034
RA6004
IC6001
+5V
SENSOR LED
SUPPLY PHOTO TR
TAKEUP PHOTO TR
P6751 1
P6751 2
P6001 1
P6001 2
SUPPLY PHOTO
TAKEUP PHOTO
R6023
R6012
R6013
R6014
C6036
R6015
TAPE END Ⓛ
TAPE BEGINING Ⓛ
REC INHIBIT SW
ON : REC ENABLE
OFF: REC INHIBIT
P6811 1
P6801 1
P6014 1
REC ENABLE SW-Ⓛ
REC INHIBIT Ⓗ
LED K
LED BROKEN Ⓗ
Q6024
P6705 1
P6704 2
P6002 2
LED A
P6705 2
P6704 1
P6002 1
125Hz
Q6010
Q6009
R6046
MODE SELECT SW
STATUS 7 PLAY MODE
STATUS 6 REV MODE
STATUS 4 FF/REW MODE
STATUS 3 STOP MODE
STATUS 1 EJECT MODE
P6813
P6803
P6003
PLAY POSI
REV POSI
FF/REW POSI
STOP POSI
EJECT POSI
RA6001
IC6009
D6 D5 D3 D2 D1
A0 A1 A2
LOADING/UNLOADING MODE
PLAY KEY ON
STOP KEY ON
B-7
A-4
IC6003 SYSTEM CONTROL CPU
RES RESET Ⓛ IN
A0 DEW 98% Ⓗ IN
A1 TAPE END DETECT Ⓛ IN
A2 TAPE BEGINING DETECT Ⓛ IN
D2 REC INHIBIT Ⓗ IN
A3 LED BROKEN Ⓗ IN
F3 SENSOR LED 125Hz OUT
C0 C1 C2 MODE SELECT CODE IN
B3 320KHz INTERRUPT SIG. IN
X1 X2 3.58MHz REFERENCE SIG. IN
C3 S/T HALL IC IN
D0 CASSETTE UP Ⓛ
D1 CASSETTE DOWN Ⓛ
C-4 D-4 C-5 D-5 C-6 D-6
X6002 IC6001
320KHz INTERRUPT OSC
3.58MHz REFERENCE OSC
X6001 C6024, C6025
P6005 8
P6005 9
TO COUNTER C.B.A
IC6010
SUPPLY HALL IC
TAKE UP HALL IC
P6708 3
P6708 2
P6704 4
P6704 5
P6002 4
P6002 5
BA6002
ADDRESS IC6003-⑫
IC6002
+12V
UP SW
ON:CASSETTE UP
DOWN SW
ON:CASSETTE DOWN
FRONT LOADING
P6751 3
P6751 4
P6001 3
P6001 4
RA6003
CASSETTE UP Ⓛ
CASSETTE DOWN Ⓛ
Q6007 Q6008
RESET CIRCUIT
RESET Ⓛ
B0 IRQ OUT
B1 ADDRESS OUT
SCK SERIAL CLOCK OUT
SERIAL DATA INHIBIT
S0 SERIAL DATA OUT
S1 SERIAL DATA IN
G0 REC E-E /Ⓗ
G1 REC. PLAY/Ⓛ
G2 DUB E-E/Ⓛ
G3 DUB REC. PLAY/Ⓛ
H3 PLAY/Ⓗ
B-A B-B A-5
RA6002
R6002
IC6011 HD7406
IC6012 HD7407P
Q6011
Q6012
Q6013
E-E Ⓛ /ON
REC. PLAY Ⓛ /ON
PLAY Ⓛ /ON
P6008 1 REC E-E +12V
P6008 2 REC/PLAY +12V
TO AUDIO CIRCUIT
P6009 2 REC/PLAY +12V
P6009 3 E-E +12V
TO VIDEO CIRCUIT
P6008 3 DUB E-E Ⓛ
P6008 4 DUB REC/PLAY Ⓛ
P6009 1 PLAY +12V
RESET
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
IRQ 2V/0.2msec. div.
ADDRESS 2V/0.2msec. div.
SERIAL CLOCK 2V/0.2msec. div.
IC6004 BA6209 FRONT LOADING DRIVE
DRIVE
DOWN/UP CONTROL
GND OUT1 VZ1 VR F R VCC1 VCC2 VZ2 OUT2
C6020
C6021
E0 FRONT LOADING DOWN Ⓗ
E1 FRONT LOADING UP Ⓗ
P6012 1
P6012 2
P6752 1
P6752 2
P6010 1
P6010 2
P6704 6
P6704 7
FRONT LOADING MOTOR
LOADING MOTOR
IC6005 BA6209 LOADING DRIVE
LOAD/UNLOAD CONTROL
C6022
C6023
IC6008
QA QB QC QD
P6013 2
P6013 1
P6802 2
P6802 1
P6812 1
P6812 2
E2 LOADING Ⓗ
E3 UNLOADING Ⓗ
H2 FWD Ⓗ REV Ⓛ
F0 F1 F2
FWD Ⓗ
REV Ⓗ
IC6006 BAL872
R6028
R6030
R6029
Q6034
Q6035
Q6036
C6048
D6048
R6104
D6024
R6106
C6032
R6105
Q6019
TP6001
R6111
R6112
R6113
C6033
R6108
R6109
Q6020
Q6021
R6115
VOLTAGE FEED BACK
IC6007
P6011
REEL DR
+16V
POWER OFF Ⓗ
Q6053
Q6054
Q6055
FF/REW POSITION Ⓛ
FROM Q6051
R6103
Q6042
FF/REW Ⓗ SEARCH FWD SEARCH REV
CURRENT FEED BACK
FRONT LOADING MODE
IC6003-⑳
IC6003-㉝
IC6003-㉞
IC6004-②
IC6003-㊲
IC6005-②
CASSETTE IN

IC6009 INFORMATION

MODE	INPUTS					OUTPUTS		
	PIN 11	PIN 12	PIN 13	PIN 2	PIN 3	PIN 9	PIN 7	PIN 6
EJECT	L	H	H	H	H	L	H	H
STOP	H	L	H	H	H	H	L	H
FF/REW	H	H	L	H	H	L	L	H
REV	H	H	H	L	H	L	H	L
PLAY	H	H	H	H	L	H	L	L

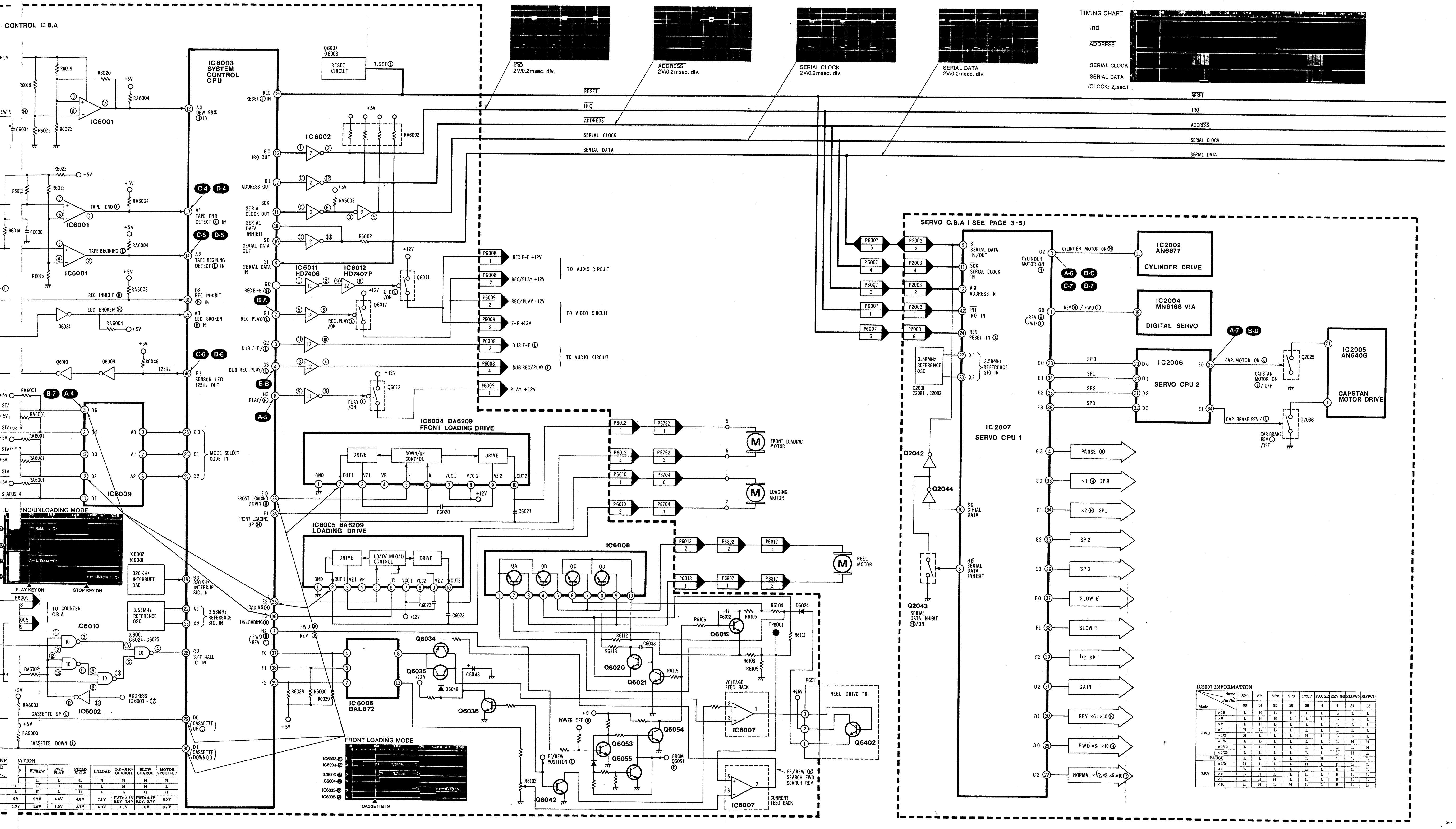
IC6006 INFORMATION

MODE / Pin No.	STOP	FF/REW	FWD PLAY	FIELD SLOW	UNLOAD	(X2 ~ X10) SEARCH	SLOW SEARCH	MOTOR SPEED-UP
4	L	L	L	L	H	H	H	H
3	L	L	H	H	L	H	H	L
2	L	H	L	H	L	L	H	H
8	0V	9.7V	4.4V	4.0V	7.1V	FWD: 5.7V REV: 7.6V	FWD: 4.4V REV: 5.7V	8.0V
13	1.0V	1.0V	1.0V	3.7V	4.0V	1.0V	1.0V	3.7V

IC6003 INFORMATION

CONDITION / PIN NO.	NO CASSETTE AND UP	CASSETTE INSERTED	CASSETTE INSERTED AND DOWN
29	L	H	H
30	H	H	L

L (1) BLOCK DIAGRAM


CONTROL C.B.A
IC6003 SYSTEM CONTROL CPU
IC6001
IC6002
IC6009
IC6010
RESET CIRCUIT
Q6007 Q6008
RESET Ⓛ
IC6011 HD7406
IC6012 HD7407P
IC6004 BA6209 FRONT LOADING DRIVE
IC6005 BA6209 LOADING DRIVE
IC6006 BAL872
IC6007
IC6008
DRIVE
DOWN/UP CONTROL
LOAD/UNLOAD CONTROL
FRONT LOADING MOTOR
LOADING MOTOR
REEL MOTOR
REEL DRIVE TR
VOLTAGE FEED BACK
CURRENT FEED BACK
TO AUDIO CIRCUIT
TO VIDEO CIRCUIT
TO COUNTER C.B.A
REC E-E +12V
REC/PLAY +12V
E-E +12V
DUB E-E Ⓛ
DUB REC/PLAY Ⓛ
PLAY +12V
320 KHz INTERRUPT OSC
3.58MHz REFERENCE OSC
X6002 IC6001
X6001 C6024, C6025
MODE SELECT CODE IN
TAPE END DETECT Ⓛ IN
TAPE BEGINING DETECT Ⓛ IN
REC INHIBIT Ⓗ IN
LED BROKEN Ⓗ IN
SENSOR LED 125Hz OUT
S/T HALL IC IN
CASSETTE UP Ⓛ
CASSETTE DOWN Ⓛ
IRQ 2V/0.2msec. div.
ADDRESS 2V/0.2msec. div.
SERIAL CLOCK 2V/0.2msec. div.
SERIAL DATA 2V/0.2msec. div.
TIMING CHART
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
(CLOCK: 2μsec.)
RESET
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
FRONT LOADING MODE
LOADING/UNLOADING MODE
PLAY KEY ON
STOP KEY ON
CASSETTE IN
SERVO C.B.A (SEE PAGE 3-5)
IC2007 SERVO CPU 1
IC2006 SERVO CPU 2
IC2002 AN6677 CYLINDER DRIVE
IC2004 MN6168 VIA DIGITAL SERVO
IC2005 AN640G CAPSTAN MOTOR DRIVE
CYLINDER MOTOR ON Ⓗ
REV Ⓗ / FWD Ⓛ
CAP. MOTOR ON Ⓛ
CAP. BRAKE REV / Ⓛ
3.58MHz REFERENCE OSC
X2001 C2081, C2082
Q2042
Q2043 SERIAL DATA INHIBIT Ⓗ/ON
Q2044
PAUSE Ⓗ
×1 Ⓗ SP0
×2 Ⓗ SP1
SP2
SP3
SLOW 0
SLOW 1
1/2 SP
GAIN
REV ×6, ×10 Ⓗ
FWD ×6, ×10 Ⓗ
NORMAL ×1/2, ×2, ×6, ×10 Ⓗ
A-4
A-5
A-6
A-7
B-7
B-A
B-B
B-C
B-D
C-4
C-5
C-6
C-7
D-4
D-5
D-6
D-7

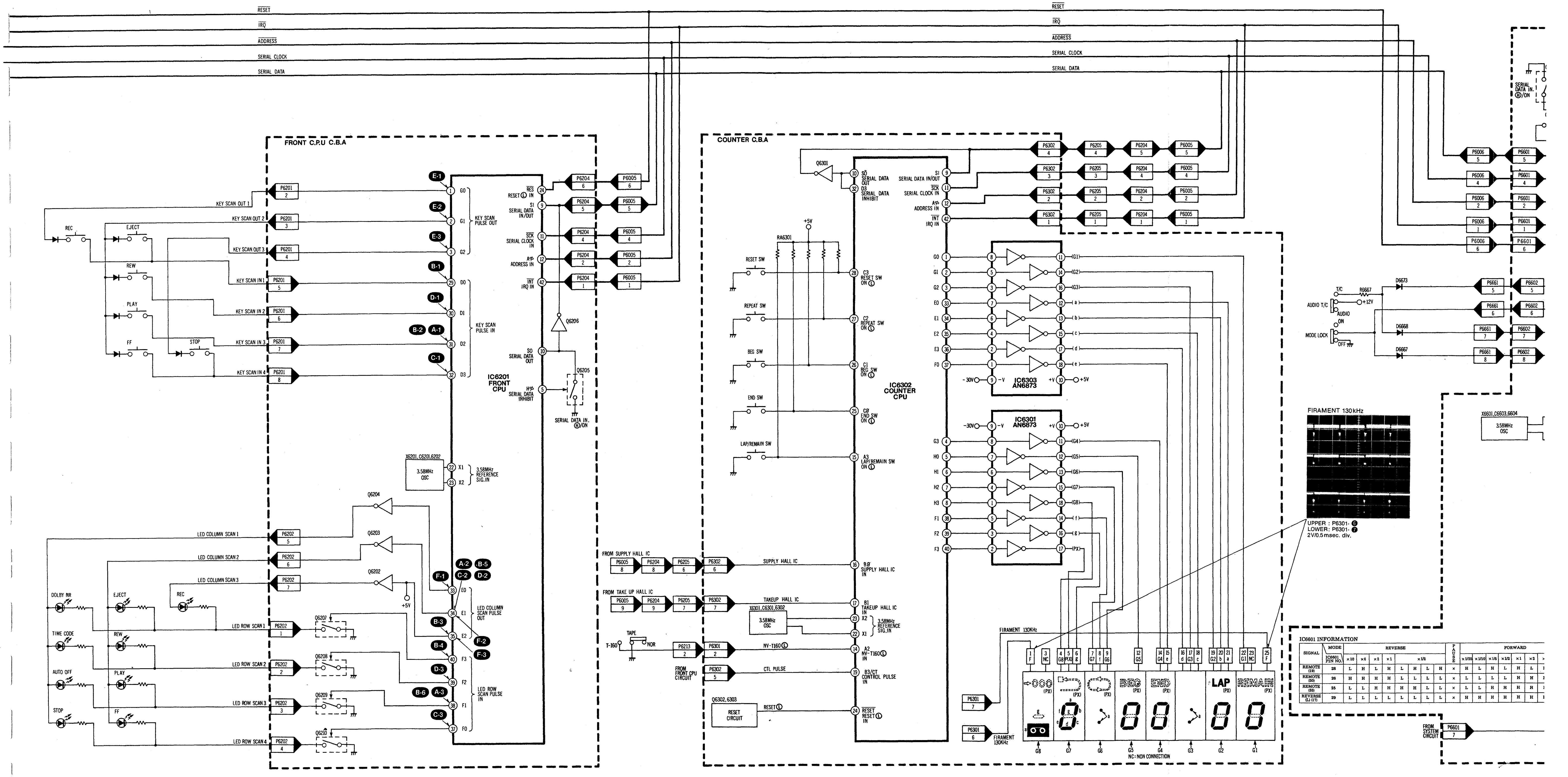
IC2007 INFORMATION

Mode	Name / Pin No.	SP0	SP1	SP2	SP3	1/2SP	PAUSE	REV (H)	SLOW0	SLOW1
		33	34	35	36	39	4	1	37	38
FWD	×10	L	H	L	H	L	L	L	L	L
	×6	L	H	H	L	L	L	L	L	L
	×2	L	H	L	L	L	L	L	L	L
	×1	H	L	L	L	L	L	L	L	L
	×1/2	H	L	L	L	H	L	L	L	L
	×1/5	L	L	L	L	L	L	L	H	H
	×1/10	L	L	L	L	L	L	L	L	H
	×1/25	L	L	L	L	L	L	L	H	L
PAUSE		L	L	L	L	L	H	L	L	L
REV	×1/2	H	L	L	L	H	L	H	L	L
	×1	L	L	L	L	L	L	H	L	L
	×2	L	H	L	L	L	L	H	L	L
	×6	L	H	H	L	L	L	H	L	L
	×10	L	H	L	H	L	L	H	L	L

NF ATION

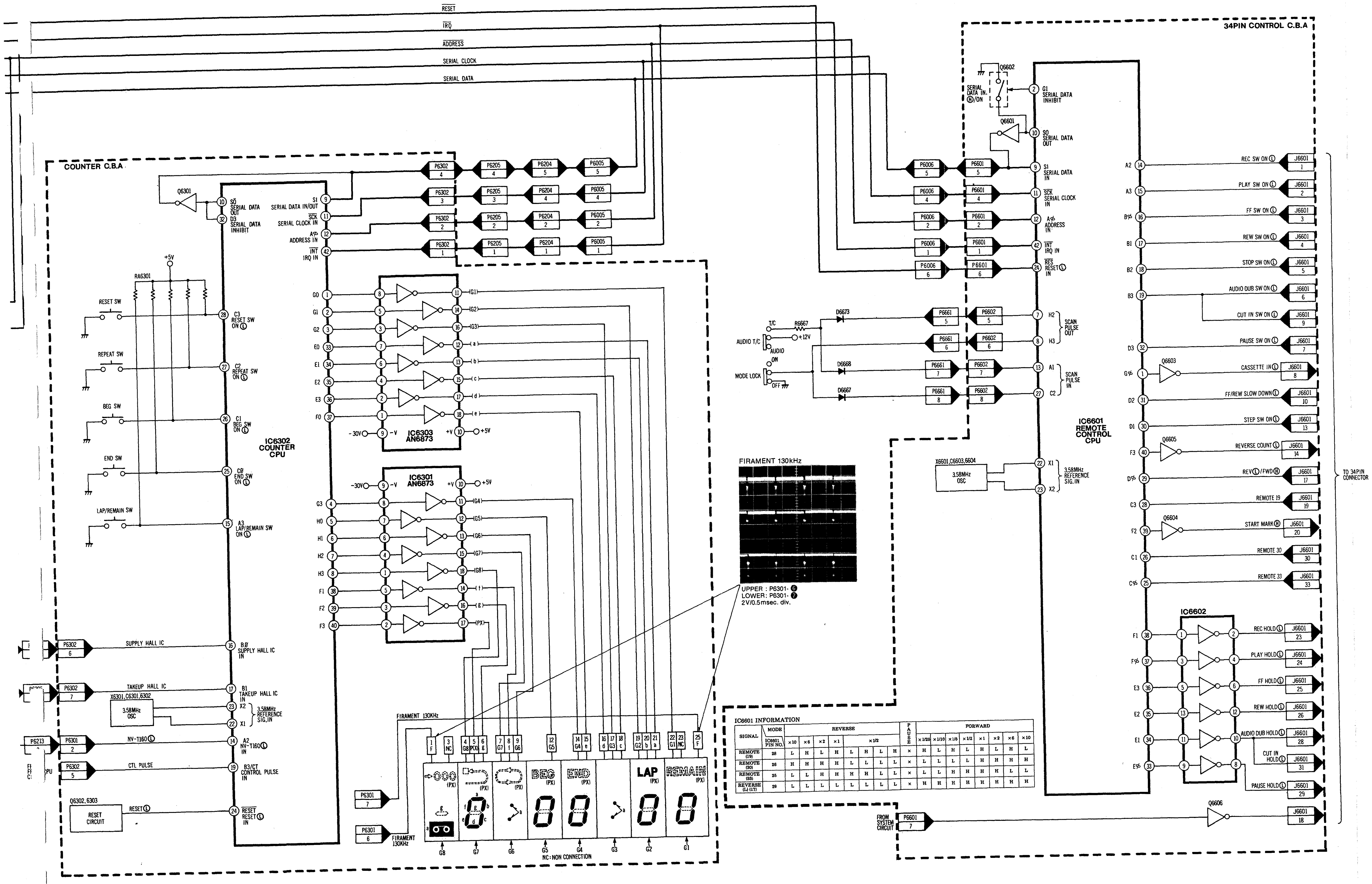
E	P	FF/REW	FWD PLAY	FIELD SLOW	UNLOAD	(X2 ~ X10) SEARCH	SLOW SEARCH	MOTOR SPEED-UP
		L	L	L	H	H	H	H
	L	L	H	H	L	H	H	L
	L	H	L	H	L	L	H	H
	0V	9.7V	4.4V	4.0V	7.1V	FWD: 5.7V REV: 7.6V	FWD: 4.4V REV: 5.7V	8.0V
	1.0V	1.0V	1.0V	3.7V	4.0V	1.0V	1.0V	3.7V

SYSTEM CONTROL (2) BLOCK DIAGRAM


RESET
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
FRONT C.P.U C.B.A
KEY SCAN OUT 1
KEY SCAN OUT 2
KEY SCAN OUT 3
KEY SCAN IN 1
KEY SCAN IN 2
KEY SCAN IN 3
KEY SCAN IN 4
REC
EJECT
REW
PLAY
FF
STOP
KEY SCAN PULSE OUT
KEY SCAN PULSE IN
IC6201 FRONT CPU
RESET IN
SERIAL DATA IN/OUT
SERIAL CLOCK IN
ADDRESS IN
IRQ IN
SERIAL DATA OUT
SERIAL DATA INHIBIT
Q6205
Q6206
SERIAL DATA IN. Ⓗ/ON
X6201,C6201,6202
3.58MHz OSC
3.58MHz REFERENCE SIG.IN
LED COLUMN SCAN 1
LED COLUMN SCAN 2
LED COLUMN SCAN 3
Q6204
Q6203
Q6202
+5V
LED COLUMN SCAN PULSE OUT
DOLBY NR
TIME CODE
AUTO OFF
LED ROW SCAN 1
LED ROW SCAN 2
LED ROW SCAN 3
LED ROW SCAN 4
Q6207
Q6208
Q6209
Q6210
LED ROW SCAN PULSE IN
P6201
P6202
P6204
P6005
E-1
E-2
E-3
B-1
D-1
B-2
A-1
C-1
A-2
B-5
C-2
D-2
F-1
B-3
F-2
B-4
F-3
D-3
B-6
A-3
C-3
COUNTER C.B.A
Q6301
SERIAL DATA OUT
SERIAL DATA INHIBIT
SERIAL DATA IN/OUT
SERIAL CLOCK IN
ADDRESS IN
IRQ IN
RA6301
RESET SW
REPEAT SW
BEG SW
END SW
LAP/REMAIN SW
RESET SW ON Ⓛ
REPEAT SW ON Ⓛ
BEG SW ON Ⓛ
END SW ON Ⓛ
LAP/REMAIN SW ON Ⓛ
IC6302 COUNTER CPU
IC6303 AN6873
IC6301 AN6873
-30V
+5V
FROM SUPPLY HALL IC
FROM TAKE UP HALL IC
SUPPLY HALL IC
TAKEUP HALL IC
SUPPLY HALL IC IN
TAKEUP HALL IC IN
X6301,C6301,6302
3.58MHz OSC
3.58MHz REFERENCE SIG.IN
T-160
TAPE
NOR
NV-T160Ⓛ
NV-T160Ⓛ IN
FROM FRONT CPU CIRCUIT
CTL PULSE
CONTROL PULSE IN
Q6302,6303
RESET CIRCUIT
RESETⓁ
RESET Ⓛ IN
P6302
P6205
P6213
P6301
FIRAMENT 130KHz
BEG
END
LAP
REMAIN
(PX)
G8
G7
G6
G5
G4
G3
G2
G1
NC: NON CONNECTION
FIRAMENT 130kHz
UPPER : P6301- 6
LOWER: P6301- 7
2V/0.5msec. div.
SERIAL DATA IN. Ⓗ/ON
P6006
P6601
P6661
P6602
T/C
R6667
+12V
AUDIO T/C
AUDIO
ON
MODE LOCK
OFF
D6673
D6668
D6667
X6601,C6603,6604
3.58MHz OSC
FROM SYSTEM CIRCUIT

IC6601 INFORMATION

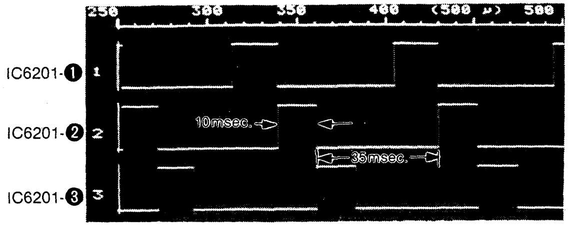
SIGNAL	MODE / IC6601 PIN NO.	REVERSE								PAUSE	FORWARD					
		×10	×6	×2	×1	×1/2					×1/25	×1/10	×1/5	×1/2	×1	×2
REMOTE (19)	28	L	H	L	H	L	H	L	H	×	H	L	H	L	H	L
REMOTE (30)	26	H	H	H	H	L	L	L	L	×	L	L	L	L	H	H
REMOTE (33)	25	L	L	H	H	H	H	L	L	×	L	L	H	H	H	H
REVERSE (L) (17)	29	L	L	L	L	L	L	L	L	×	H	H	H	H	H	H


RESET
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
COUNTER C.B.A
34PIN CONTROL C.B.A
IC6302 COUNTER CPU
IC6303 AN6873
IC6301 AN6873
IC6601 REMOTE CONTROL CPU
IC6602
Q6301
Q6601
Q6602
RA6301
RESET SW
REPEAT SW
BEG SW
END SW
LAP/REMAIN SW
SUPPLY HALL IC
TAKEUP HALL IC
3.58MHz OSC
NV-T160
CTL PULSE
RESET CIRCUIT
FIRAMENT 130KHz
NC : NON CONNECTION
BEG
END
LAP
REMAIN
FIRAMENT 130kHz
UPPER : P6301-⑦
LOWER: P6301-⑥
2V/0.5msec. div.
AUDIO T/C
MODE LOCK
X6601,C6603,6604
3.58MHz OSC
REC SW ON
PLAY SW ON
FF SW ON
REW SW ON
STOP SW ON
AUDIO DUB SW ON
CUT IN SW ON
PAUSE SW ON
CASSETTE IN
FF/REW SLOW DOWN
STEP SW ON
REVERSE COUNT
REV/FWD
REMOTE 19
START MARK
REMOTE 30
REMOTE 33
REC HOLD
PLAY HOLD
FF HOLD
REW HOLD
AUDIO DUB HOLD
CUT IN HOLD
PAUSE HOLD
FROM SYSTEM CIRCUIT
TO 34PIN CONNECTOR

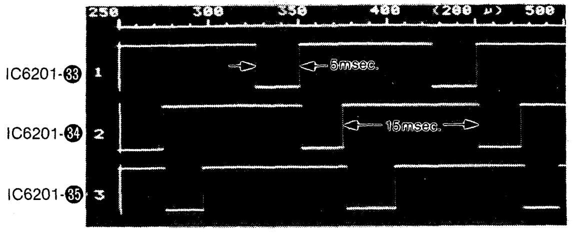
IC6601 INFORMATION

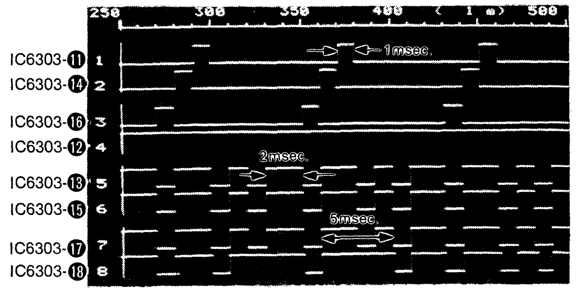
SIGNAL	MODE / IC6601 PIN NO.	REVERSE ×10	×6	×2	×1	×1/2				PAUSE	FORWARD ×1/25	×1/10	×1/5	×1/2	×1	×2	×6	×10
REMOTE (19)	28	L	H	L	H	L	H	L	H	×	H	L	H	L	H	L	H	L
REMOTE (30)	26	H	H	H	H	L	L	L	L	×	L	L	L	L	H	H	H	H
REMOTE (33)	25	L	L	H	H	H	H	L	L	×	L	L	H	H	H	H	L	L
REVERSE (L) (17)	29	L	L	L	L	L	L	L	L	×	H	H	H	H	H	H	H	H

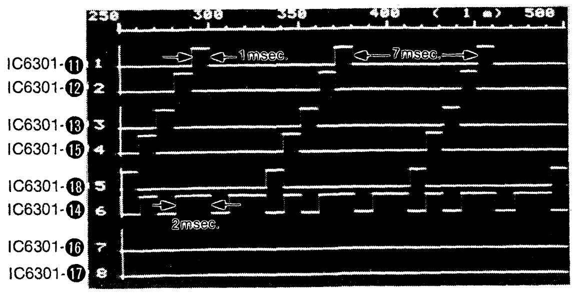
Ⓔ LED SCAN PULSE



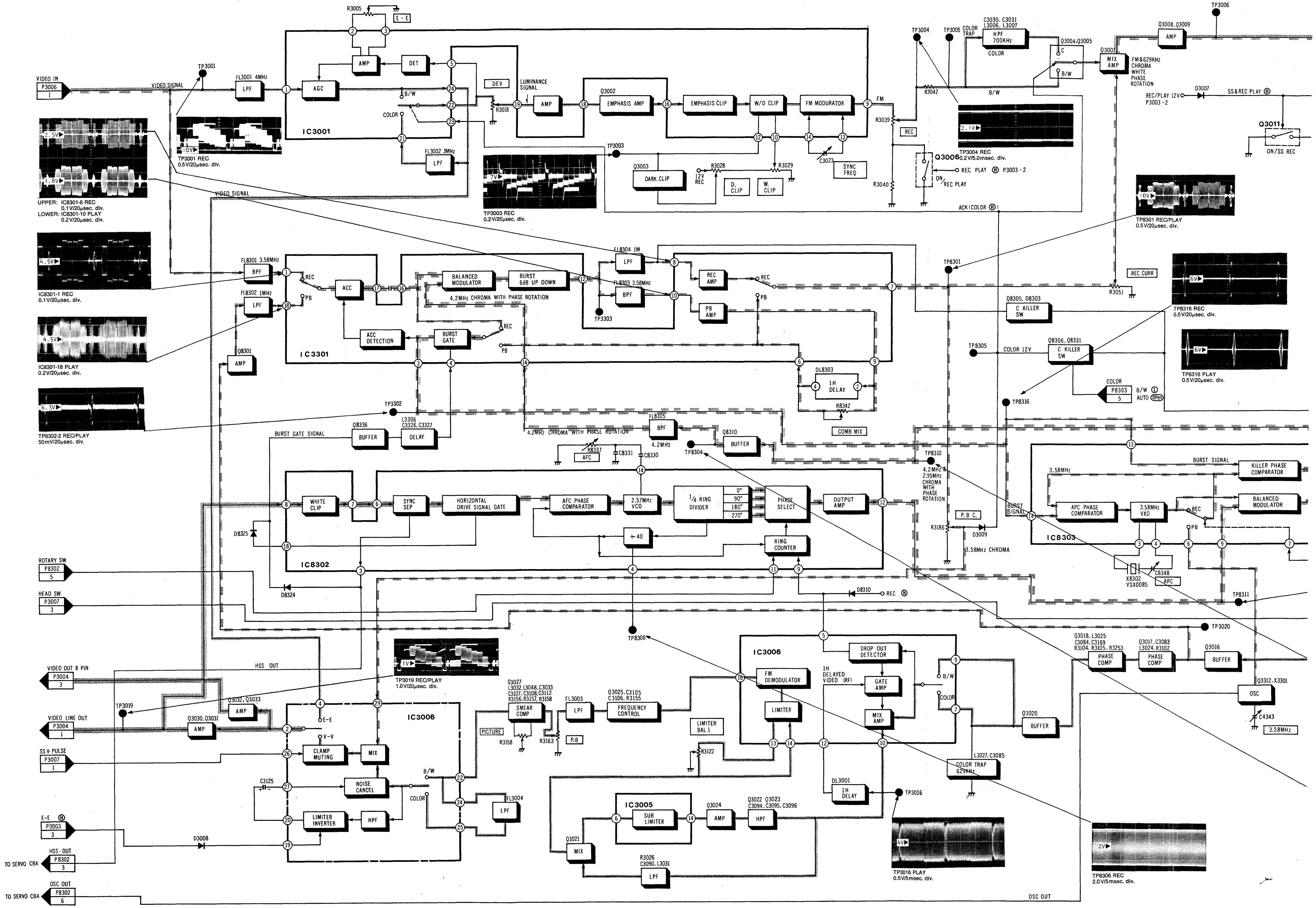
Ⓕ KEY SCAN PULSE



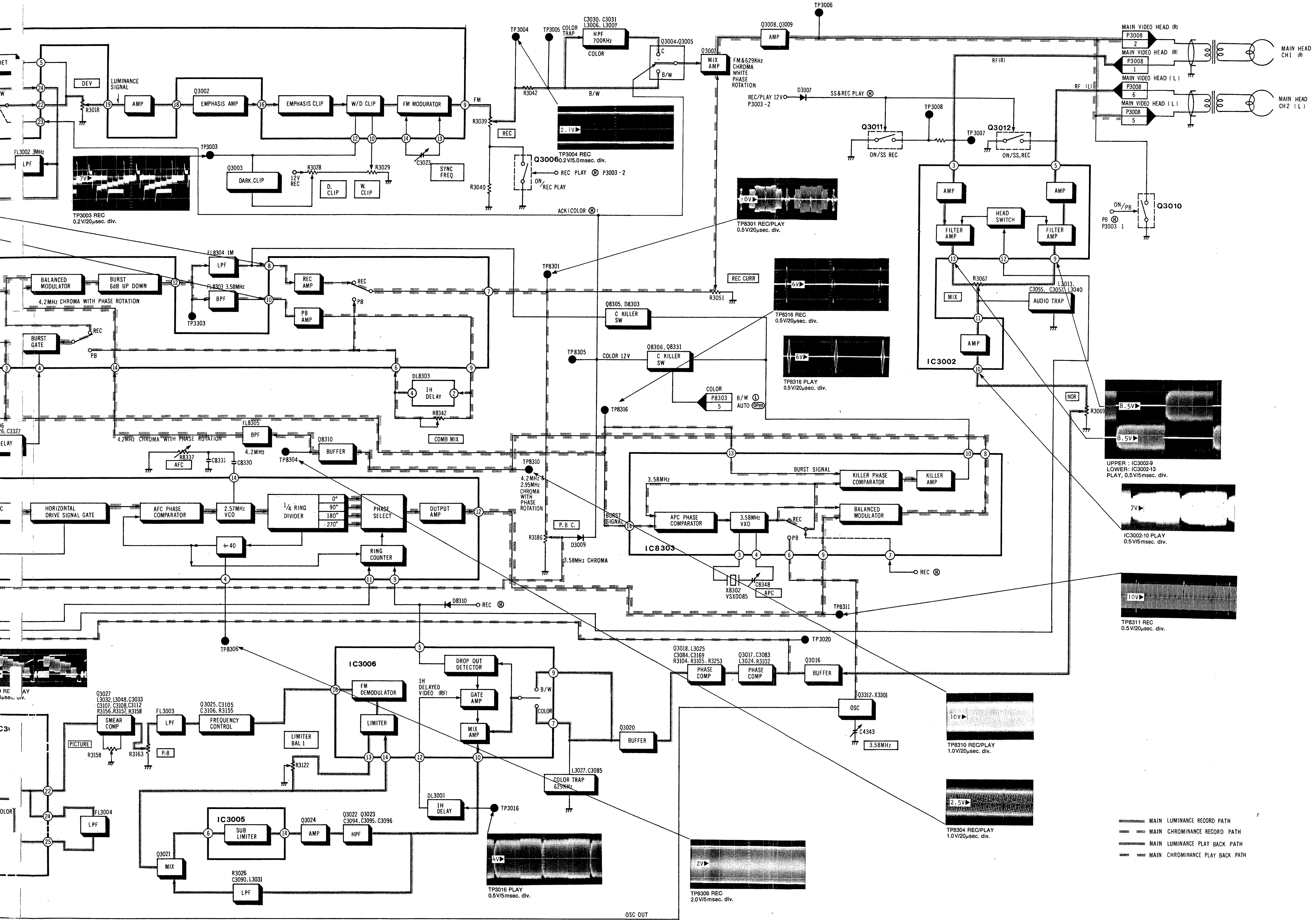




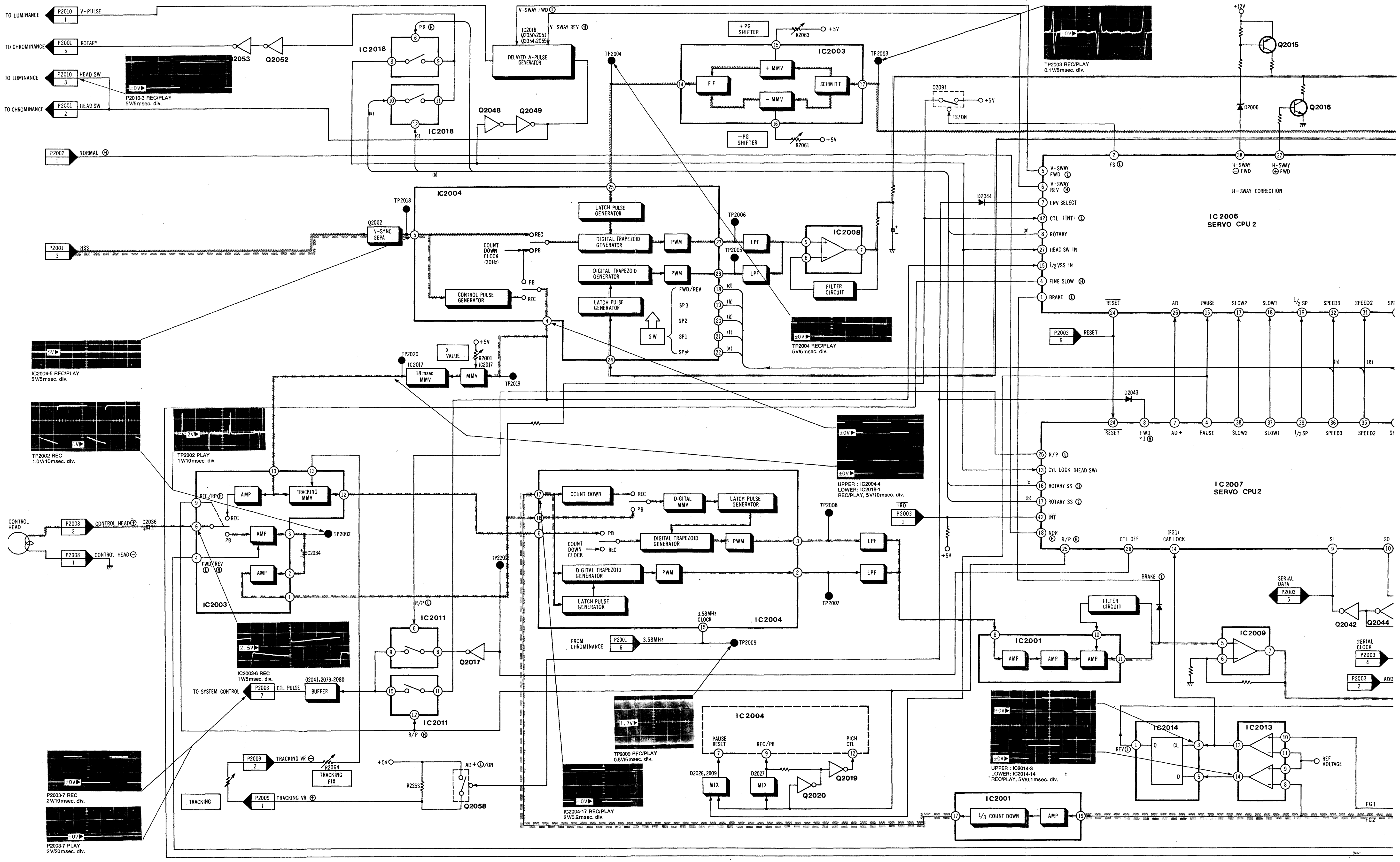
LUMINANCE & CHROMINANCE BLOCK DIAGRAM

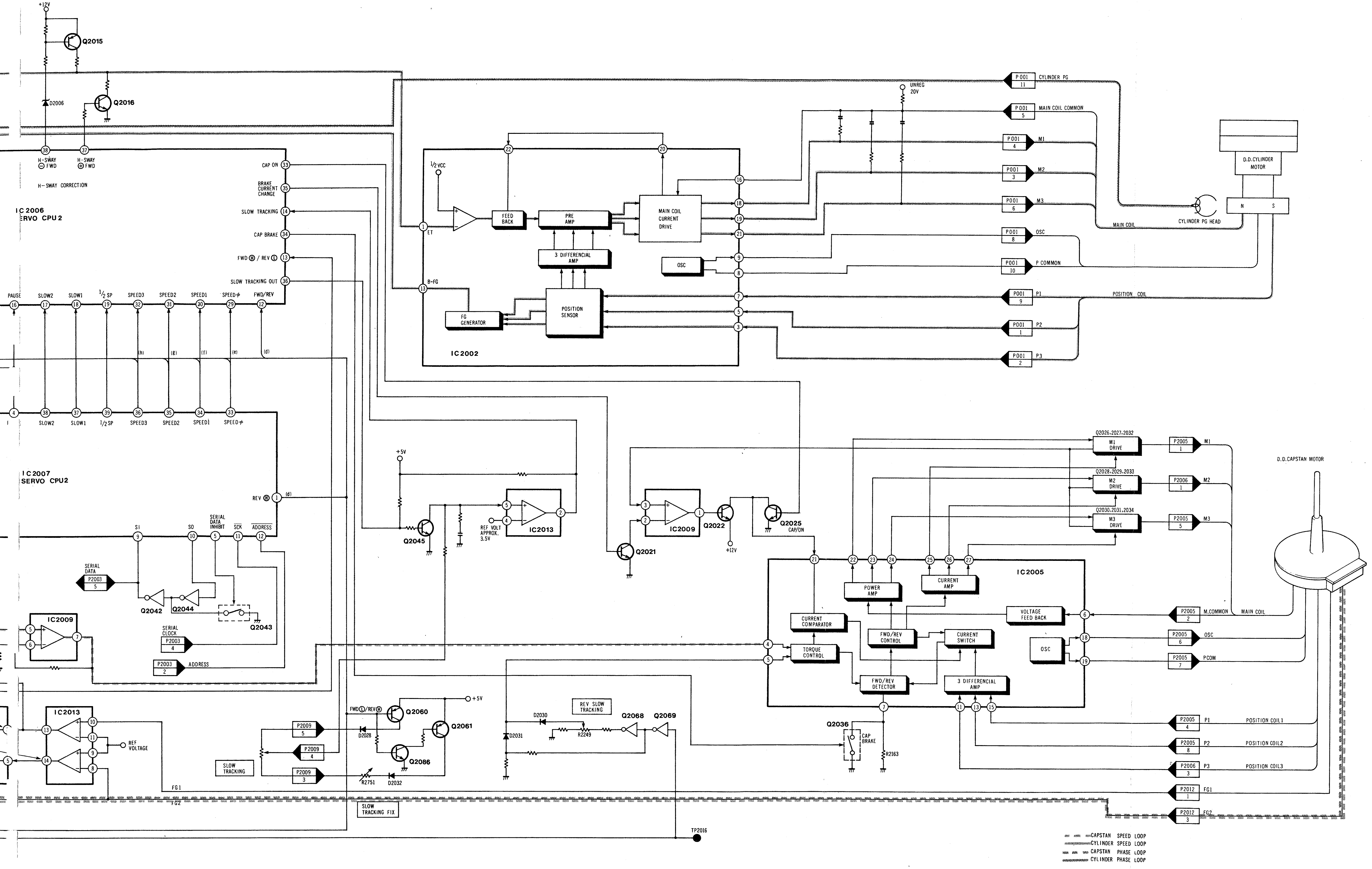

VIDEO IN
P3006
1
VIDEO SIGNAL
TP3001
FL3001 4MHz
LPF
R3005
E-E
AGC
AMP
DET
B/W
COLOR
IC3001
FL3002 3MHz
LPF
DEV
LUMINANCE SIGNAL
R3018
AMP
Q3002
EMPHASIS AMP
EMPHASIS CLIP
W/D CLIP
FM MODURATOR
FM
R3039
REC
R3040
TP3003
Q3003
DARK CLIP
12V REC
R3028
D. CLIP
W. CLIP
R3029
C3023
SYNC FREQ
Q3006
REC PLAY
P3003-2
ON/REC PLAY
ACK (COLOR) H
TP3004
TP3005
COLOR TRAP
C3030, C3031
L3006, L3007
HPF 700KHz
COLOR
R3042
B/W
Q3004, Q3005
C
B/W
Q3007
MIX AMP
FM&629KHz CHROMA WHITE PHASE ROTATION
TP3006
Q3008, Q3009
AMP
REC/PLAY 12V
P3003-2
D3007
SS&REC PLAY H
Q3011
ON/SS REC
TP3001 REC
0.5V/20μsec. div.
TP3003 REC
0.2V/20μsec. div.
TP3004 REC
0.2V/5.0msec. div.
UPPER: IC8301-8 REC
0.1V/20μsec. div.
LOWER: IC8301-10 PLAY
0.2V/20μsec. div.
IC8301-1 REC
0.1V/20μsec. div.
IC8301-18 PLAY
0.2V/20μsec. div.
TP8302-2 REC/PLAY
50mV/20μsec. div.
TP8301 REC/PLAY
0.5V/20μsec. div.
TP8316 REC
0.5V/20μsec. div.
TP8316 PLAY
0.5V/20μsec. div.
VIDEO SIGNAL
FL8301 3.58MHz
BPF
FL8302 1MHz
LPF
Q8301
AMP
REC
PB
ACC
ACC DETECTION
BURST GATE
BALANCED MODULATOR
BURST 6dB UP DOWN
4.2MHz CHROMA WITH PHASE ROTATION
IC3301
FL8304 1M
LPF
FL8303 3.58MHz
BPF
TP3303
REC AMP
PB AMP
DL8303
1H DELAY
R8342
COMB MIX
TP3302
TP8301
REC CURR
R3051
Q8305, Q8303
C KILLER SW
TP8305
COLOR 12V
Q8306, Q8331
C KILLER SW
COLOR
P8303
5
B/W L
AUTO Open
TP8316
BURST GATE SIGNAL
Q8336
BUFFER
L3306
C3326, C3327
DELAY
4.2MHz CHROMA WITH PHASE ROTATION
FL8305
BPF
4.2MHz
Q8310
BUFFER
TP8304
R8337
AFC
C8331
C8330
WHITE CLIP
SYNC SEP
HORIZONTAL DRIVE SIGNAL GATE
AFC PHASE COMPARATOR
2.57MHz VCO
1/4 RING DIVIDER
0°
90°
180°
270°
PHASE SELECT
OUTPUT AMP
÷40
RING COUNTER
D8325
IC8302
D8324
TP8310
4.2MHz & 2.95MHz CHROMA WITH PHASE ROTATION
P.B.C.
R3186
D3009
3.58MHz CHROMA
BURST SIGNAL
3.58MHz
APC PHASE COMPARATOR
3.58MHz VXO
KILLER PHASE COMPARATOR
BALANCED MODULATOR
IC8303
X8302
VSX0085
C8348
APC
TP8311
D8310
REC H
ROTARY SW
P8302
5
HEAD SW
P3007
3
TP8306
TP3020
VIDEO OUT 8 PIN
P3004
3
HSS OUT
TP3019
TP3019 REC/PLAY
1.0V/20μsec. div.
Q3032, Q3033
AMP
VIDEO LINE OUT
P3004
1
Q3030, Q3031
AMP
E-E
V-V
SS V-PULSE
P3007
1
CLAMP MUTING
MIX
NOISE CANCEL
C3125
LIMITER INVERTER
HPF
IC3006
B/W
COLOR
FL3004
LPF
E-E H
P3003
3
D3008
TO SERVO CBA
HSS-OUT
P8302
3
OSC OUT
P8302
6
OSC OUT
Q3027
L3032, L3048, C3033
C3107, C3108, C3112
R3156, R3157, R3158
SMEAR COMP
PICTURE
R3158
R3163
P.B
FL3003
LPF
Q3025, C3105
C3106, R3155
FREQUENCY CONTROL
LIMITER BAL 1
R3122
IC3006
FM DEMODULATOR
LIMITER
1H DELAYED VIDEO (RF)
DROP OUT DETECTOR
GATE AMP
MIX AMP
B/W
COLOR
DL3001
1H DELAY
TP3016
IC3005
SUB LIMITER
Q3024
AMP
Q3022 Q3023
C3094, C3095, C3096
HPF
Q3021
MIX
R3026
C3090, L3031
LPF
L3027, C3085
COLOR TRAP 629KHz
Q3020
BUFFER
Q3018, L3025
C3084, C3169
R3104, R3105, R3253
PHASE COMP
Q3017, C3083
L3024, R3102
PHASE COMP
Q3016
BUFFER
Q3312, X3301
OSC
C4343
3.58MHz
TP3016 PLAY
0.5V/5msec. div.
TP8306 REC
2.0V/5msec. div.

LOCK DIAGRAM

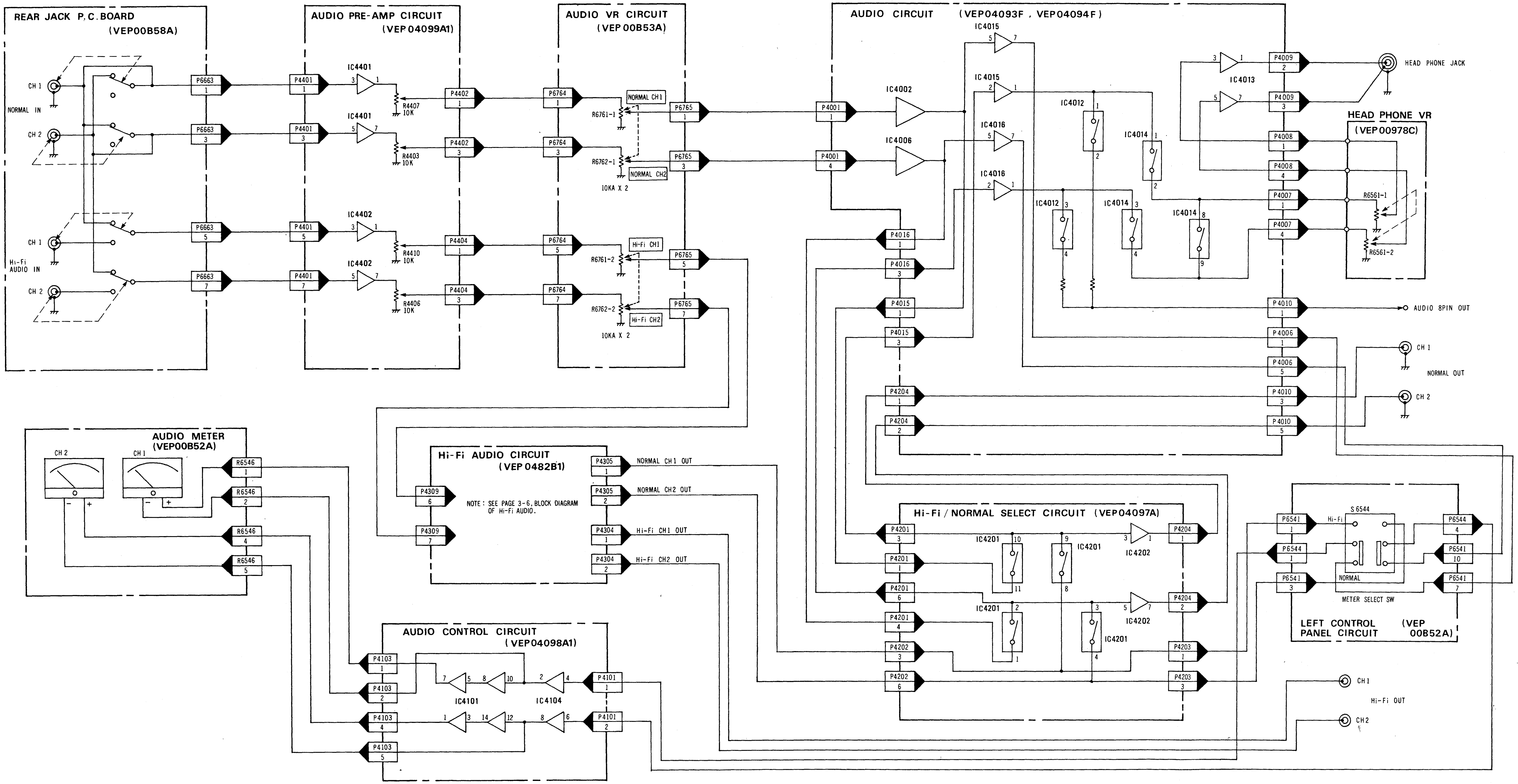

TP3006
TP3004
TP3005
COLOR TRAP
C3030, C3031 L3006, L3007
HPF 700KHz
COLOR
Q3004,Q3005
C
B/W
Q3007
MIX AMP
FM&629KHz CHROMA WHITE PHASE ROTATION
Q3008,Q3009
AMP
MAIN VIDEO HEAD (R)
P3008 2
MAIN VIDEO HEAD (R)
P3008 1
MAIN VIDEO HEAD (L)
P3008 6
MAIN VIDEO HEAD (L)
P3008 5
MAIN HEAD CH1 (R)
MAIN HEAD CH2 (L)
RF(R)
RF (L)
REC/PLAY 12V
P3003-2
D3007
SS&REC PLAY Ⓗ
TP3008
Q3011
ON/SS REC
TP3007
Q3012
ON/SS.REC
DEV
LUMINANCE SIGNAL
R3018
AMP
Q3002
EMPHASIS AMP
EMPHASIS CLIP
W/D CLIP
FM MODURATOR
FM
R3042
B/W
R3039
REC
Q3006
REC PLAY Ⓗ P3003-2
ON/REC PLAY
R3040
TP3003
FL3002 3MHz
LPF
Q3003
DARK.CLIP
12V REC
R3028
D. CLIP
W. CLIP
R3029
C3023
SYNC FREQ
7V
TP3003 REC 0.2V/20μsec. div.
2.1V
TP3004 REC 0.2V/5.0msec. div.
ACK(COLOR Ⓗ)
0V
TP8301 REC/PLAY 0.5V/20μsec. div.
IC3002
AMP
AMP
HEAD SWITCH
FILTER AMP
FILTER AMP
R3067
MIX
C3055, C3057, L3013, L3040
AUDIO TRAP
AMP
ON/PB
PB Ⓗ
P3003 1
Q3010
FL8304 1M
LPF
BALANCED MODULATOR
BURST 6dB UP DOWN
FL8303 3.58MHz
BPF
TP3303
4.2MHz CHROMA WITH PHASE ROTATION
REC AMP
REC
PB
PB AMP
TP8301
REC CURR
R3051
Q8305, D8303
C KILLER SW
6V
TP8316 REC 0.5V/20μsec. div.
BURST GATE
REC
PB
DL8303
1H DELAY
R8342
COMB MIX
TP8305
COLOR 12V
Q8306, Q8331
C KILLER SW
6V
TP8316 PLAY 0.5V/20μsec. div.
COLOR
P8303 5
B/W Ⓛ
AUTO Open
TP8316
NOR
R3069
8.5V
8.5V
UPPER : IC3002-9
LOWER: IC3002-13
PLAY, 0.5V/5msec. div.
FL8305
BPF
4.2MHz CHROMA WITH PHASE ROTATION
4.2MHz
R8337
AFC
C8331
C8330
Q8310
BUFFER
TP8304
TP8310
4.2MHz & 2.95MHz CHROMA WITH PHASE ROTATION
BURST SIGNAL
KILLER PHASE COMPARATOR
KILLER AMP
3.58MHz
APC PHASE COMPARATOR
3.58MHz VXO
REC
PB
BALANCED MODULATOR
IC8303
BURST SIGNAL
7V
IC3002-10 PLAY 0.5V/5msec. div.
HORIZONTAL DRIVE SIGNAL GATE
AFC PHASE COMPARATOR
2.57MHz VCO
1/4 RING DIVIDER
0°
90°
180°
270°
PHASE SELECT
OUTPUT AMP
÷40
RING COUNTER
P.B C.
R3186
D3009
3.58MHz CHROMA
X8302 VSX0085
C8348
APC
REC Ⓗ
TP8311
10V
TP8311 REC 0.5V/20μsec. div.
D8310
REC Ⓗ
TP8306
TP3020
IC3006
DROP OUT DETECTOR
FM DEMODULATOR
1H DELAYED VIDEO (RF)
GATE AMP
B/W
COLOR
LIMITER
MIX AMP
Q3018, L3025 C3084, C3169 R3104, R3105, R3253
PHASE COMP
Q3017, C3083 L3024, R3102
PHASE COMP
Q3016
BUFFER
Q3312, X3301
OSC
C4343
3.58MHz
10V
TP8310 REC/PLAY 1.0V/20μsec. div.
Q3027 L3032, L3048, C3033 C3107, C3108, C3112 R3156, R3157, R3158
SMEAR COMP
PICTURE
R3158
FL3003
LPF
R3163
P.B
Q3025, C3105 C3106, R3155
FREQUENCY CONTROL
LIMITER BAL 1
R3122
Q3020
BUFFER
L3027, C3085
COLOR TRAP 629KHz
DL3001
1H DELAY
TP3016
FL3004
LPF
IC3005
SUB LIMITER
Q3024
AMP
Q3022 Q3023 C3094, C3095, C3096
HPF
Q3021
MIX
R3026 C3090, L3031
LPF
OSC OUT
4V
TP3016 PLAY 0.5V/5msec. div.
2V
TP8306 REC 2.0V/5msec. div.
2.5V
TP8304 REC/PLAY 1.0V/20μsec. div.
MAIN LUMINANCE RECORD PATH
MAIN CHROMINANCE RECORD PATH
MAIN LUMINANCE PLAY BACK PATH
MAIN CHROMINANCE PLAY BACK PATH

CYLINDER & CAPSTAN SERVO BLOCK DIAGRAM

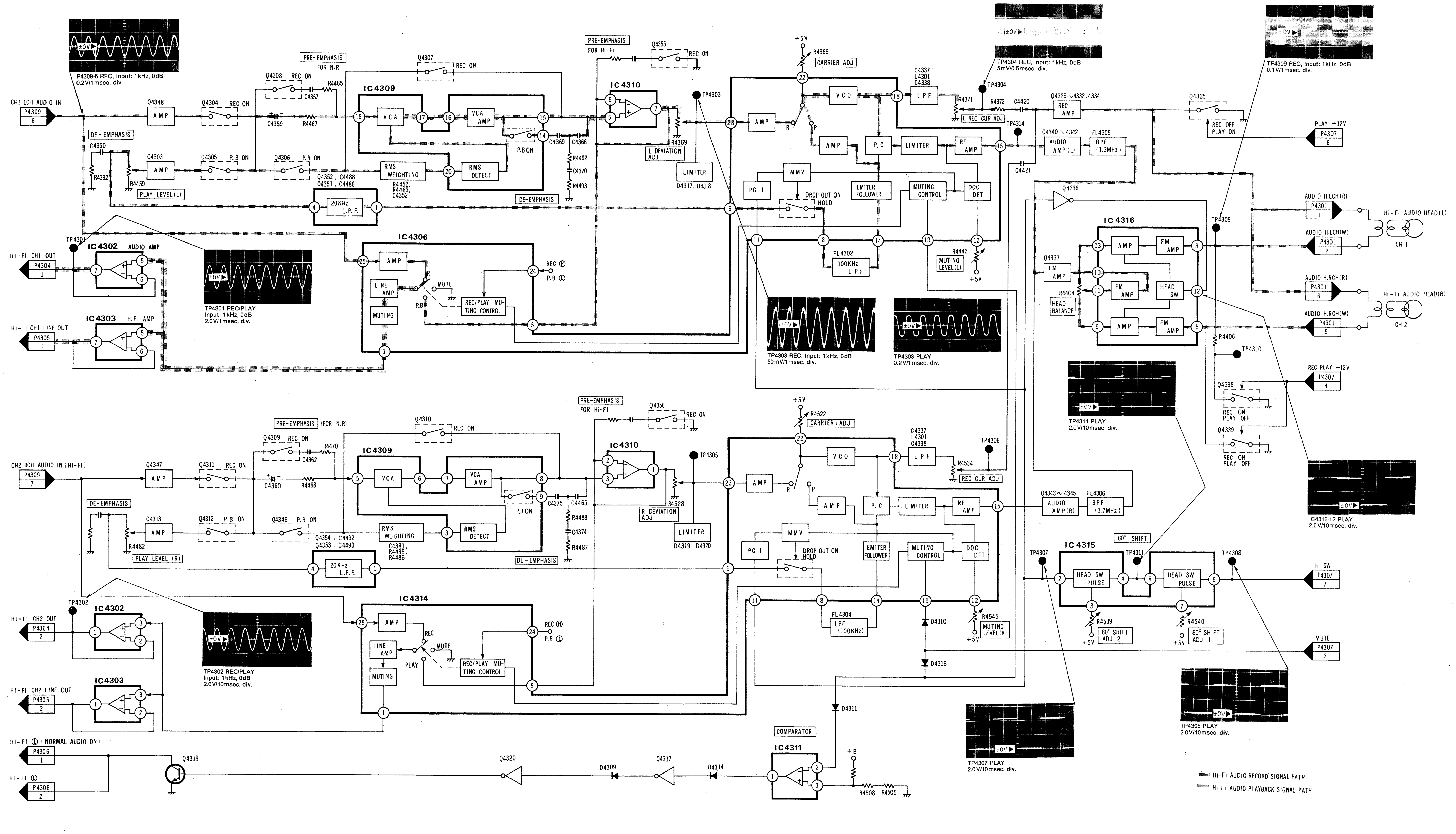

TO LUMINANCE
P2010 1
V-PULSE
TO CHROMINANCE
P2001 5
ROTARY
TO LUMINANCE
P2010 3
HEAD SW
TO CHROMINANCE
P2001 2
HEAD SW
Q2053
Q2052
P2010-3 REC/PLAY
5V/5msec. div.
P2002 1
NORMAL Ⓗ
P2001 3
HSS
IC2018
PB Ⓗ
(a)
(b)
(c)
V-SWAY FWD Ⓛ
V-SWAY REV Ⓗ
IC2016
Q2050-2051
Q2054-2055
DELAYED V-PULSE GENERATOR
Q2048
Q2049
+PG SHIFTER
-PG SHIFTER
R2063
R2061
+5V
IC2003
FF
+ MMV
- MMV
SCHMITT
TP2004
TP2003
TP2003 REC/PLAY
0.1V/5msec. div.
Q2091
FS/ON
+12V
Q2015
Q2016
D2006
FS Ⓛ
H-SWAY Ⓖ FWD
H-SWAY ⊕ FWD
H-SWAY CORRECTION
IC2004
TP2018
Q2002
V-SYNC SEPA
COUNT DOWN CLOCK (30Hz)
REC
PB
CONTROL PULSE GENERATOR
LATCH PULSE GENERATOR
DIGITAL TRAPEZOID GENERATOR
PWM
LPF
TP2006
TP2005
IC2008
FILTER CIRCUIT
FWD/REV
SP3
SP2
SP1
SP#
SW
TP2004 REC/PLAY
5V/5msec. div.
D2044
V-SWAY FWD Ⓛ
V-SWAY REV Ⓗ
ENV SELECT
CTL (INT) Ⓛ
ROTARY
HEAD SW IN
1/2 VSS IN
FINE SLOW Ⓗ
BRAKE Ⓛ
IC2006
SERVO CPU 2
RESET
AD
PAUSE
SLOW2
SLOW1
1/2 SP
SPEED3
SPEED2
P2003 6
RESET
IC2004-5 REC/PLAY
5V/5msec. div.
TP2020
IC2017
18 msec MMV
MMV
X VALUE
R2001
IC2017
TP2019
D2043
FWD ×1 Ⓗ
AD+
TP2002 REC
1.0V/10msec. div.
TP2002 PLAY
1V/10msec. div.
UPPER : IC2004-4
LOWER: IC2018-1
REC/PLAY, 5V/10msec. div.
R/P Ⓛ
CYL LOCK (HEAD SW)
ROTARY SS Ⓗ
ROTARY SS Ⓛ
INT
NOR Ⓗ
R/P Ⓗ
IC2007
SERVO CPU2
IRQ
P2003 1
CTL OFF
(FG1) CAP LOCK
S1
S0
CONTROL HEAD
P2008 2
CONTROL HEAD⊕
C2036
P2008 1
CONTROL HEAD⊖
REC/RP Ⓗ
AMP
TRACKING MMV
FWD/REV Ⓛ Ⓡ
C2034
TP2002
IC2003
COUNT DOWN
DIGITAL MMV
LATCH PULSE GENERATOR
COUNT DOWN CLOCK
TP2008
TP2007
TP2001
3.58MHz CLOCK
FROM CHROMINANCE
P2001 6
3.58MHz
TP2009
BRAKE Ⓛ
FILTER CIRCUIT
IC2001
IC2009
SERIAL DATA
P2003 5
Q2042
Q2044
SERIAL CLOCK
P2003 4
P2003 2
ADD
IC2003-6 REC
1V/5msec. div.
TO SYSTEM CONTROL
P2003 7
CTL PULSE
Q2041,2079,2080
BUFFER
IC2011
Q2017
R/P Ⓗ
P2009 2
TRACKING VR ⊖
R2064
TRACKING FIX
TRACKING
P2009 1
TRACKING VR ⊕
+5V
AD+ Ⓛ/ON
R2253
Q2058
TP2009 REC/PLAY
0.5V/5msec. div.
IC2004-17 REC/PLAY
2V/0.2msec. div.
IC2004
PAUSE RESET
REC/PB
PICH CTL
D2026,2009
D2027
MIX
Q2020
Q2019
UPPER : IC2014-3
LOWER: IC2014-14
REC/PLAY, 5V/0.1msec. div.
IC2014
REV Ⓛ
IC2013
REF VOLTAGE
1/3 COUNT DOWN
FG1
FG2
P2003-7 REC
2V/10msec. div.
P2003-7 PLAY
2V/20msec. div.


+12V
Q2015
Q2016
D2006
H-SWAY ⊖ FWD
H-SWAY ⊕ FWD
H-SWAY CORRECTION
IC2006
SERVO CPU2
CAP ON
BRAKE CURRENT CHANGE
SLOW TRACKING
CAP BRAKE
FWD Ⓗ / REV Ⓛ
SLOW TRACKING OUT
PAUSE
SLOW2
SLOW1
1/2 SP
SPEED3
SPEED2
SPEED1
SPEED ϕ
FWD/REV
IC2007
SERVO CPU2
REV Ⓗ
SI
SO
SERIAL DATA INHIBIT
SCK
ADDRESS
SERIAL DATA
P2003
SERIAL CLOCK
Q2042
Q2044
Q2043
IC2009
IC2013
REF VOLTAGE
FG1
FG2
+5V
REF VOLT APPROX. 3.5V
Q2045
Q2021
Q2022
Q2025
CAP/ON
FWD Ⓛ / REV Ⓗ
Q2060
Q2061
Q2086
D2028
D2032
R2751
P2009
SLOW TRACKING
SLOW TRACKING FIX
REV SLOW TRACKING
D2030
D2031
R2249
Q2068
Q2069
Q2036
CAP BRAKE
R2163
TP2016
1/2 VCC
ET
B-FG
FEED BACK
PRE AMP
MAIN COIL CURRENT DRIVE
3 DIFFERENCIAL AMP
OSC
POSITION SENSOR
FG GENERATOR
IC2002
UNREG 20V
P001
CYLINDER PG
MAIN COIL COMMON
M1
M2
M3
OSC
P COMMON
P1
P2
P3
POSITION COIL
MAIN COIL
D.D.CYLINDER MOTOR
CYLINDER PG HEAD
N
S
Q2026,2027,2032
M1 DRIVE
Q2028,2029,2033
M2 DRIVE
Q2030,2031,2034
M3 DRIVE
IC2005
POWER AMP
CURRENT AMP
CURRENT COMPARATOR
TORQUE CONTROL
FWD/REV CONTROL
CURRENT SWITCH
VOLTAGE FEED BACK
OSC
FWD/REV DETECTOR
3 DIFFERENCIAL AMP
P2005
P2006
P2012
M.COMMON
PCOM
POSITION COIL1
POSITION COIL2
POSITION COIL3
D.D.CAPSTAN MOTOR
CAPSTAN SPEED LOOP
CYLINDER SPEED LOOP
CAPSTAN PHASE LOOP
CYLINDER PHASE LOOP

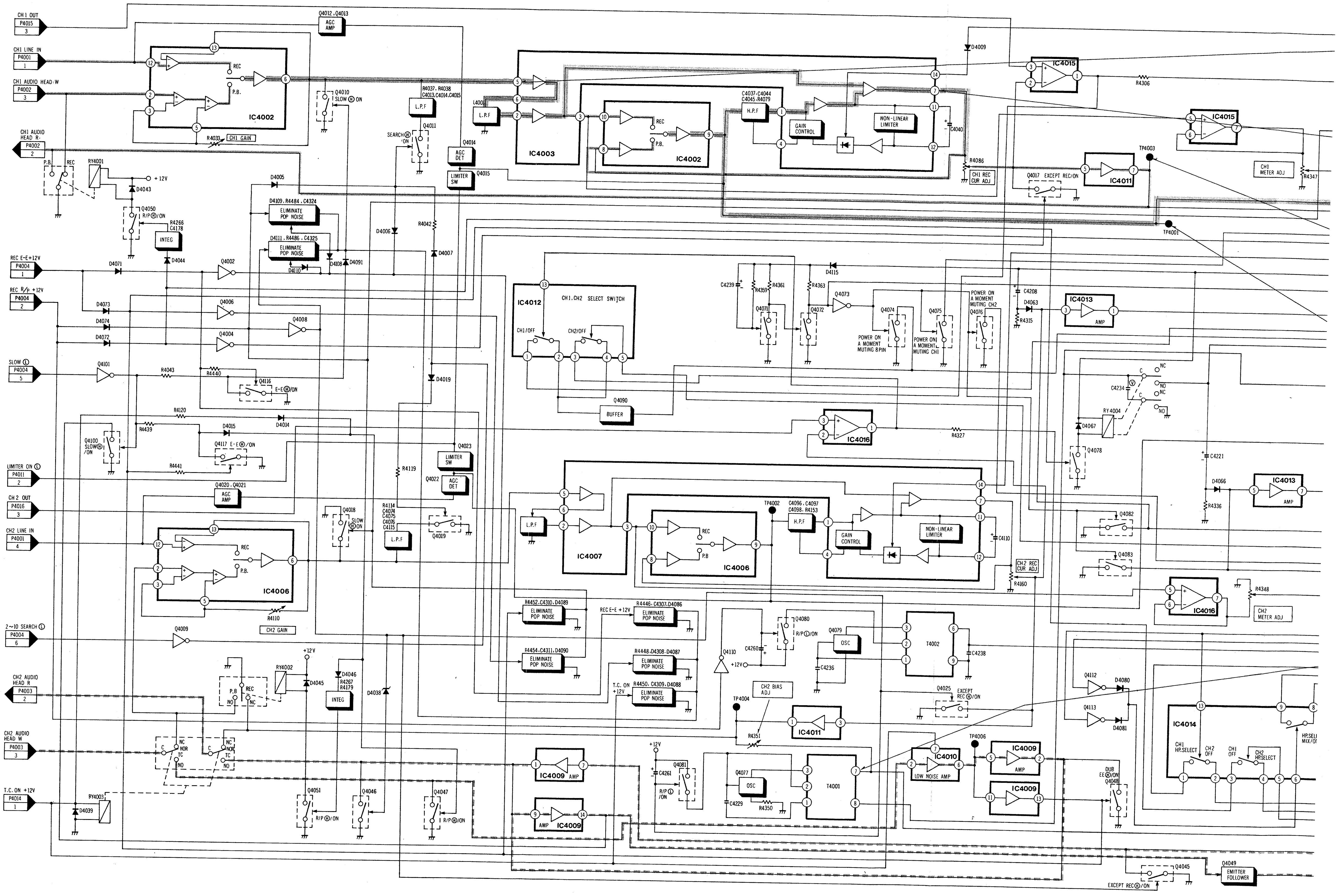
AUDIO OVERALL BLOCK DIAGRAM

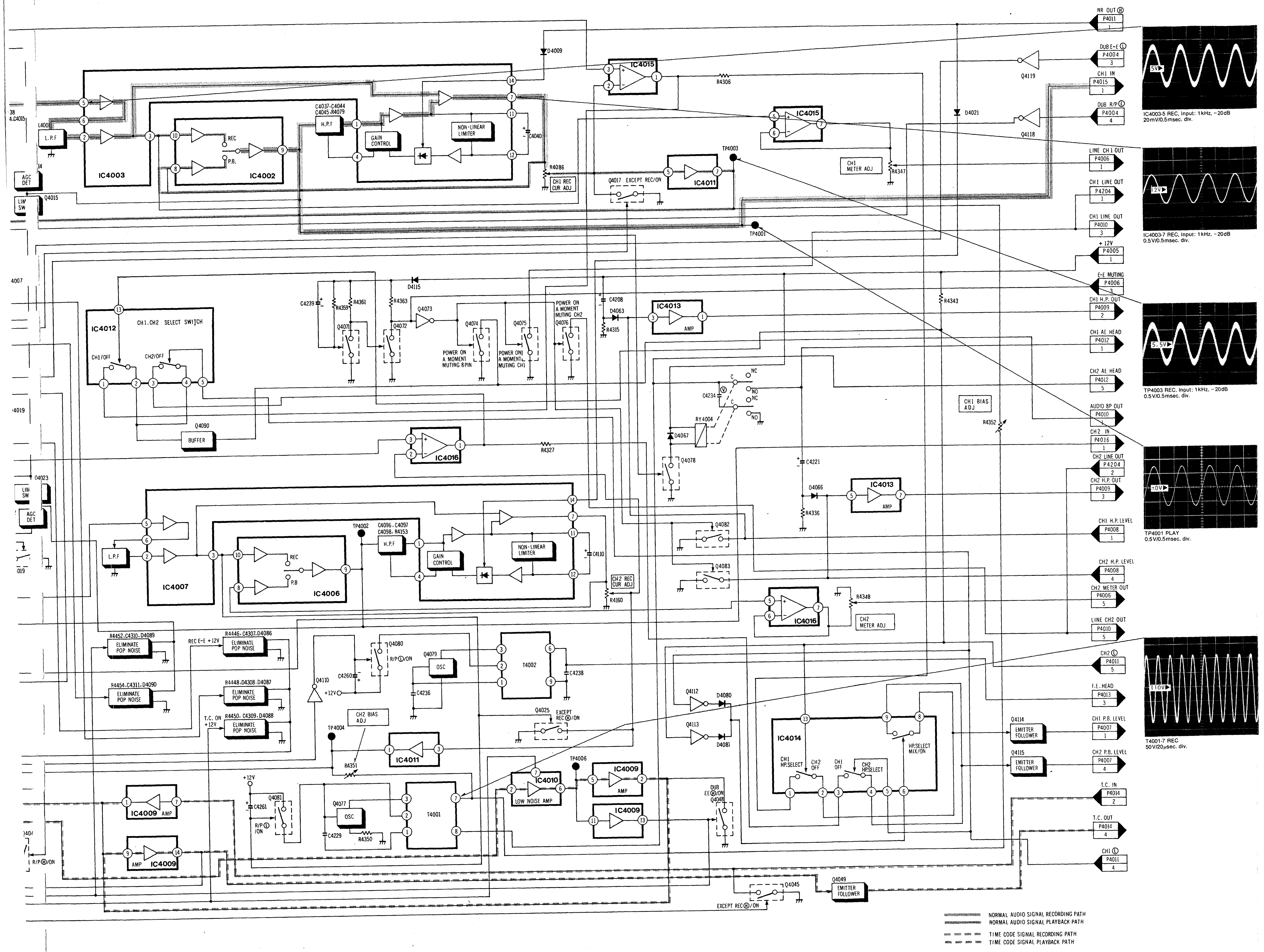

REAR JACK P.C.BOARD (VEP00B58A)
CH 1
NORMAL IN
CH 2
CH 1
Hi-Fi AUDIO IN
CH 2
P6663
AUDIO PRE-AMP CIRCUIT (VEP04099A1)
P4401
IC4401
IC4402
R4407 10K
R4403 10K
R4410 10K
R4406 10K
P4402
P4404
AUDIO VR CIRCUIT (VEP00B53A)
P6764
P6765
NORMAL CH1
NORMAL CH2
Hi-Fi CH1
Hi-Fi CH2
R6761-1
R6762-1
R6761-2
R6762-2
10KA X 2
AUDIO CIRCUIT (VEP04093F, VEP04094F)
P4001
IC4002
IC4006
IC4015
IC4016
IC4012
IC4014
IC4013
P4016
P4015
P4204
P4009
P4008
P4007
P4010
P4006
HEAD PHONE JACK
HEAD PHONE VR (VEP00978C)
R6561-1
R6561-2
AUDIO 8PIN OUT
CH 1
NORMAL OUT
CH 2
AUDIO METER (VEP00B52A)
CH 2
CH 1
R6546
Hi-Fi AUDIO CIRCUIT (VEP0482B1)
P4309
NOTE: SEE PAGE 3-6, BLOCK DIAGRAM OF Hi-Fi AUDIO.
P4305
P4304
NORMAL CH1 OUT
NORMAL CH2 OUT
Hi-Fi CH1 OUT
Hi-Fi CH2 OUT
AUDIO CONTROL CIRCUIT (VEP04098A1)
P4103
P4101
IC4101
IC4104
Hi-Fi / NORMAL SELECT CIRCUIT (VEP04097A)
P4201
P4202
P4203
IC4201
IC4202
S6544
Hi-Fi
NORMAL
METER SELECT SW
P6541
P6544
LEFT CONTROL PANEL CIRCUIT (VEP 00B52A)
CH1
Hi-Fi OUT
CH2

Hi-Fi AUDIO BLOCK DIAGRAM

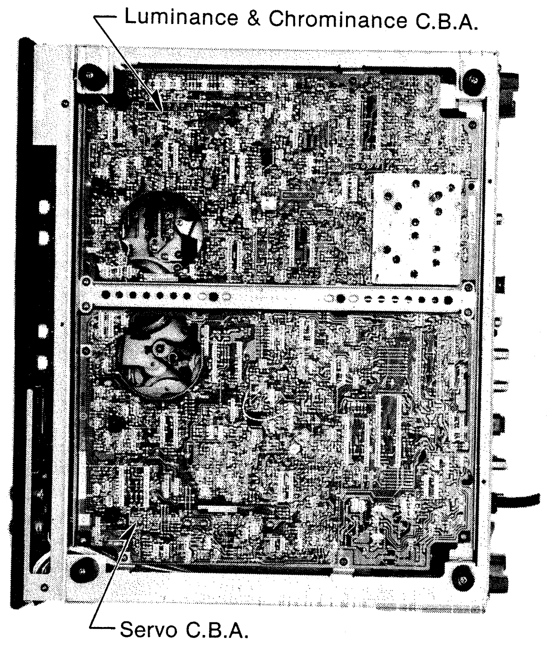

P4309-6 REC, Input: 1kHz, 0dB
0.2V/1msec. div.
CH1 LCH AUDIO IN
P4309
6
Q4348
AMP
Q4304 REC ON
PRE-EMPHASIS FOR N.R
Q4308 REC ON
C4357
R4465
C4359
R4467
Q4307 REC ON
IC4309
VCA
VCA AMP
RMS WEIGHTING
RMS DETECT
P.B ON
Q4352, C4488
Q4351, C4486
R4452, R4463, C4352
20KHz L.P.F.
DE-EMPHASIS
C4350
R4392
Q4303
AMP
R4459
PLAY LEVEL(L)
Q4305 P.B ON
Q4306 P.B ON
C4369
C4366
R4492
C4370
R4493
PRE-EMPHASIS FOR Hi-Fi
Q4355 REC ON
IC4310
L DEVIATION ADJ
R4369
LIMITER
D4317, D4318
TP4303
+5V
R4366
CARRIER ADJ
VCO
AMP
LPF
C4337 L4301 C4338
R4371
L REC CUR ADJ
TP4304
R4372
C4420
TP4314
P.C
LIMITER
RF AMP
MMV
PG 1
DROP OUT ON HOLD
EMITER FOLLOWER
MUTING CONTROL
DOC DET
FL4302 100KHz LPF
R4442
MUTING LEVEL(L)
+5V
TP4304 REC, Input: 1kHz, 0dB
5mV/0.5msec. div.
TP4309 REC, Input: 1kHz, 0dB
0.1V/1msec. div.
Q4329～4332, 4334
REC AMP
Q4340～4342
AUDIO AMP(L)
FL4305
BPF (1.3MHz)
C4421
Q4335
REC OFF PLAY ON
PLAY +12V
P4307
6
Q4336
TP4309
IC4316
AMP
FM AMP
HEAD SW
Q4337
FM AMP
R4404
HEAD BALANCE
AUDIO H.LCH(R)
P4301
1
AUDIO H.LCH(W)
P4301
2
AUDIO H.RCH(R)
P4301
6
AUDIO H.RCH(W)
P4301
5
Hi-Fi AUDIO HEAD(L)
CH 1
Hi-Fi AUDIO HEAD(R)
CH 2
R4406
TP4310
REC PLAY +12V
P4307
4
Q4338
REC ON PLAY OFF
Q4339
REC ON PLAY OFF
TP4301
IC4302 AUDIO AMP
HI-FI CH1 OUT
P4304
1
IC4303 H.P. AMP
HI-FI CH1 LINE OUT
P4305
1
TP4301 REC/PLAY
Input: 1kHz, 0dB
2.0V/1msec. div.
IC4306
AMP
LINE AMP
MUTING
MUTE
REC/PLAY MUTING CONTROL
REC
P.B
TP4303 REC, Input: 1kHz, 0dB
50mV/1msec. div.
TP4303 PLAY
0.2V/1msec. div.
TP4311 PLAY
2.0V/10msec. div.
IC4316-12 PLAY
2.0V/10msec. div.
CH2 RCH AUDIO IN(HI-FI)
P4309
7
Q4347
AMP
Q4311 REC ON
PRE-EMPHASIS (FOR N.R)
Q4309 REC ON
R4470
C4362
C4360
R4468
Q4310 REC ON
IC4309
VCA
VCA AMP
RMS WEIGHTING
RMS DETECT
Q4354, C4492
Q4353, C4490
C4381, R4485, R4486
20KHz L.P.F.
DE-EMPHASIS
Q4313
AMP
R4482
PLAY LEVEL (R)
Q4312 P.B ON
Q4346 P.B ON
C4375
C4465
R4488
C4374
R4487
PRE-EMPHASIS FOR Hi-Fi
Q4356 REC ON
IC4310
R4528
R DEVIATION ADJ
LIMITER
D4319, D4320
TP4305
+5V
R4522
CARRIER ADJ
VCO
LPF
C4337 L4301 C4338
R4534
REC CUR ADJ
TP4306
AMP
P.C
LIMITER
RF AMP
MMV
PG 1
DROP OUT ON HOLD
EMITER FOLLOWER
MUTING CONTROL
DOC DET
FL4304 LPF (100KHz)
D4310
D4316
R4545
MUTING LEVEL(R)
+5V
Q4343～4345
AUDIO AMP(R)
FL4306
BPF (1.7MHz)
60° SHIFT
IC4315
TP4307
TP4311
TP4308
HEAD SW PULSE
R4539
60° SHIFT ADJ 2
R4540
60° SHIFT ADJ 1
H. SW
P4307
7
MUTE
P4307
3
TP4302
IC4302
HI-FI CH2 OUT
P4304
2
IC4303
HI-FI CH2 LINE OUT
P4305
2
TP4302 REC/PLAY
Input: 1kHz, 0dB
2.0V/10msec. div.
IC4314
AMP
LINE AMP
MUTING
REC
MUTE
PLAY
REC/PLAY MUTING CONTROL
D4311
COMPARATOR
IC4311
+B
R4508
R4505
HI-FI ⓛ (NORMAL AUDIO ON)
P4306
1
HI-FI ⓛ
P4306
2
Q4319
Q4320
D4309
Q4317
D4314
TP4307 PLAY
2.0V/10msec. div.
TP4308 PLAY
2.0V/10msec. div.
±0V
Hi-Fi AUDIO RECORD SIGNAL PATH
Hi-Fi AUDIO PLAYBACK SIGNAL PATH

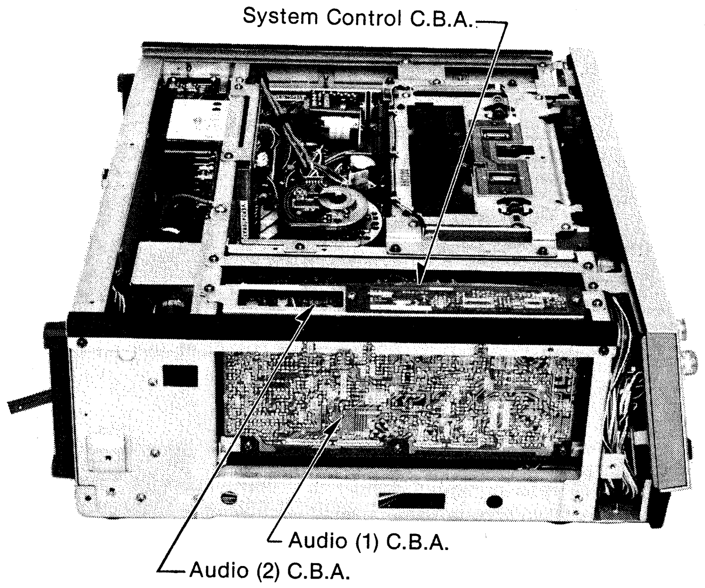
AUDIO BLOCK DIAGRAM

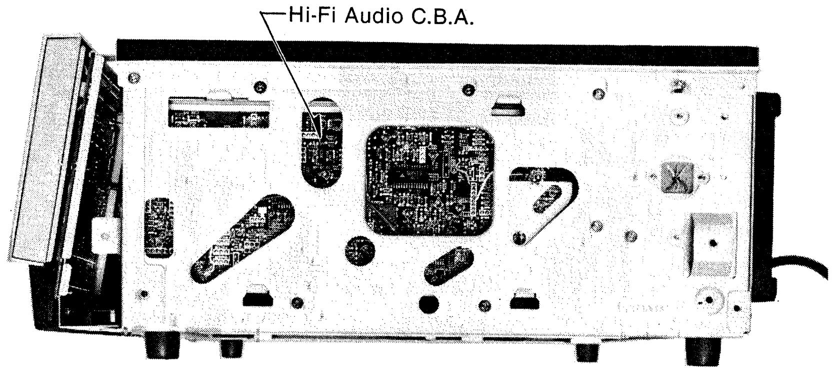

CH1 OUT
P4015
3
CH1 LINE IN
P4001
1
CH1 AUDIO HEAD·W
P4002
3
CH1 AUDIO HEAD R
P4002
2
P.B.
REC
RY4001
+12V
D4043
Q4050
R/P Ⓗ/ON
R4266
C4178
INTEG
D4044
REC E-E+12V
P4004
1
D4071
REC R/P +12V
P4004
2
D4073
D4074
D4072
SLOW Ⓛ
P4004
5
Q4101
R4043
R4440
Q4116
E-E Ⓗ/ON
R4120
R4439
D4015
D4014
Q4100
SLOW Ⓗ/ON
Q4117 E-E Ⓗ/ON
R4441
LIMITER ON Ⓛ
P4011
2
CH2 OUT
P4016
3
CH2 LINE IN
P4001
4
2~10 SEARCH Ⓛ
P4004
6
Q4009
CH2 AUDIO HEAD R
P4003
2
CH2 AUDIO HEAD W
P4003
3
T.C. ON +12V
P4014
1
RY4003
D4039
Q4012, Q4013
AGC AMP
IC4002
REC
P.B.
R4033
CH1 GAIN
Q4010
SLOW Ⓗ ON
D4005
D4109, R4484, C4324
ELIMINATE POP NOISE
D4111, R4486, C4325
ELIMINATE POP NOISE
D4110
D4108
D4091
Q4002
Q4006
Q4008
Q4004
R4037, R4038
C4013, C4014, C4015
L.P.F
Q4011
SEARCH Ⓗ/ON
Q4014
AGC DET
LIMITER SW
Q4015
D4006
R4042
D4007
D4019
L4001
IC4003
IC4002
REC
P.B.
C4037-C4044
C4045, R4079
H.P.F
GAIN CONTROL
NON-LINEAR LIMITER
C4040
R4086
CH1 REC CUR ADJ
D4009
IC4015
R4306
IC4015
Q4017 EXCEPT REC/ON
IC4011
TP4003
TP4001
CH1 METER ADJ
R4347
IC4012
CH1, CH2 SELECT SWITCH
CH1/OFF
CH2/OFF
Q4090
BUFFER
C4239
R4359
R4361
R4363
D4115
Q4071
Q4072
Q4073
Q4074
Q4075
POWER ON A MOMENT MUTING 8PIN
POWER ON A MOMENT MUTING CH1
POWER ON A MOMENT MUTING CH2
Q4076
C4208
D4063
R4315
IC4013
AMP
IC4016
R4327
C4234
RY4004
D4067
Q4078
NC
NO
C
C4221
D4066
R4336
IC4013
AMP
Q4082
Q4083
IC4016
R4348
CH2 METER ADJ
Q4020, Q4021
AGC AMP
IC4006
REC
P.B.
R4110
CH2 GAIN
Q4018
SLOW Ⓗ ON
R4119
R4114
C4074
C4075
C4076
C4115
L.P.F
Q4023
LIMITER SW
Q4022
AGC DET
Q4019
IC4007
TP4002
C4096, C4097
C4098, R4153
H.P.F
GAIN CONTROL
NON-LINEAR LIMITER
C4110
IC4006
CH2 REC CUR ADJ
R4160
R4452, C4310, D4089
ELIMINATE POP NOISE
REC E-E +12V
R4446, C4307, D4086
ELIMINATE POP NOISE
R4454, C4311, D4090
ELIMINATE POP NOISE
R4448, D4308, D4087
ELIMINATE POP NOISE
T.C. ON +12V
R4450, C4309, D4088
ELIMINATE POP NOISE
Q4080
R/P Ⓛ/ON
Q4110
C4260
+12V
Q4079
OSC
C4236
T4002
C4238
CH2 BIAS ADJ
TP4004
R4351
IC4011
Q4025 EXCEPT REC Ⓗ/ON
+12V
RY4002
P.B
REC
NO
NC
D4045
D4046
R4267
R4179
INTEG
D4038
NC
NOR
TC
NO
C
Q4051
R/P Ⓗ/ON
Q4046
Q4047
R/P Ⓗ/ON
IC4009
AMP
IC4009
AMP
+12V
C4261
Q4081
R/P Ⓛ/ON
Q4077
OSC
C4229
R4350
T4001
IC4010
LOW NOISE AMP
TP4006
IC4009
AMP
IC4009
Q4112
D4080
Q4113
D4081
IC4014
CH1 HP.SELECT
CH2 OFF
CH1 OFF
CH2 HP.SELECT
HP.SEL MIX/OF
DUB EE Ⓗ/ON
Q4048
Q4045
EXCEPT REC Ⓗ/ON
Q4049
EMITTER FOLLOWER


IC4003
IC4002
IC4015
IC4011
IC4012
CH1.CH2 SELECT SWITCH
CH1/OFF
CH2/OFF
Q4090
BUFFER
IC4016
IC4013
AMP
IC4007
IC4006
IC4014
IC4009
IC4010
LOW NOISE AMP
T4001
T4002
OSC
L.P.F
H.P.F
GAIN CONTROL
NON-LINEAR LIMITER
REC
P.B.
AGC DET
LIM SW
Q4015
D4009
D4021
D4115
D4063
D4067
D4066
D4080
D4081
R4306
R4327
R4343
R4347
R4086
R4359
R4361
R4363
R4315
R4336
R4348
R4160
R4351
R4350
R4352
C4037-C4044
C4045.R4079
C4096.C4097
C4098.R4153
C4040
C4110
C4239
C4208
C4234
C4221
C4260
C4236
C4238
C4261
C4229
CH1 REC CUR ADJ
CH2 REC CUR ADJ
CH1 METER ADJ
CH2 METER ADJ
CH1 BIAS ADJ
CH2 BIAS ADJ
Q4017 EXCEPT REC/ON
TP4003
TP4001
TP4002
TP4004
TP4006
Q4071
Q4072
Q4073
Q4074
Q4075
Q4076
POWER ON A MOMENT MUTING 8PIN
POWER ON A MOMENT MUTING CH1
POWER ON A MOMENT MUTING CH2
RY4004
Q4078
Q4082
Q4083
Q4112
Q4113
Q4118
Q4119
Q4110
Q4079
Q4080
R/P Ⓛ/ON
Q4025
EXCEPT REC Ⓡ/ON
Q4077
Q4081
R/P Ⓛ/ON
Q4048
DUB EE Ⓡ/ON
Q4045
EXCEPT REC Ⓡ/ON
Q4049
EMITTER FOLLOWER
Q4114
Q4115
CH1 HP.SELECT
CH2 OFF
CH1 OFF
CH2 HP.SELECT
HP.SELECT MIX/ON
R4452.C4310.D4089
R4446.C4307.D4086
R4454.C4311.D4090
R4448.D4308.D4087
R4450.C4309.D4088
ELIMINATE POP NOISE
REC E-E +12V
T.C. ON +12V
+12V
NR OUT Ⓡ P4011 1
DUB E-E Ⓛ P4004 3
CH1 IN P4015 1
DUB R/P Ⓛ P4004 4
LINE CH1 OUT P4006 1
CH1 LINE OUT P4204 1
CH1 LINE OUT P4010 3
+12V P4005 1
E-E MUTING P4006 3
CH1 H.P. OUT P4009 2
CH1 AE HEAD P4012 1
CH2 AE HEAD P4012 5
AUDIO 8P OUT P4010
CH2 IN P4016 1
CH2 LINE OUT P4204 2
CH2 H.P. OUT P4009 3
CH1 H.P. LEVEL P4008 1
CH2 H.P. LEVEL P4008 4
CH2 METER OUT P4006 5
LINE CH2 OUT P4010 5
CH2 Ⓛ P4011 5
F.E. HEAD P4013 3
CH1 P.B. LEVEL P4007 1
CH2 P.B. LEVEL P4007 4
T.C. IN P4014 2
T.C. OUT P4014 4
CH1 Ⓛ P4011 4
5V
IC4003-5 REC, Input: 1kHz, −20dB
20mV/0.5msec. div.
12V
IC4003-7 REC, Input: 1kHz, −20dB
0.5V/0.5msec. div.
5.5V
TP4003 REC. Input: 1kHz, −20dB
0.5V/0.5msec. div.
±0V
TP4001 PLAY
0.5V/0.5msec. div.
110V
T4001-7 REC
50V/20μsec. div.
NORMAL AUDIO SIGNAL RECORDING PATH
NORMAL AUDIO SIGNAL PLAYBACK PATH
TIME CODE SIGNAL RECORDING PATH
TIME CODE SIGNAL PLAYBACK PATH

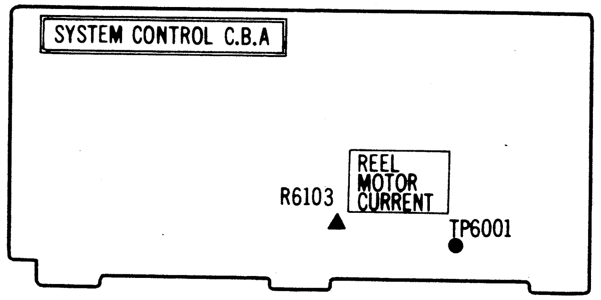
Location of Test Points & Controls


Luminance & Chrominance C.B.A.
Servo C.B.A.

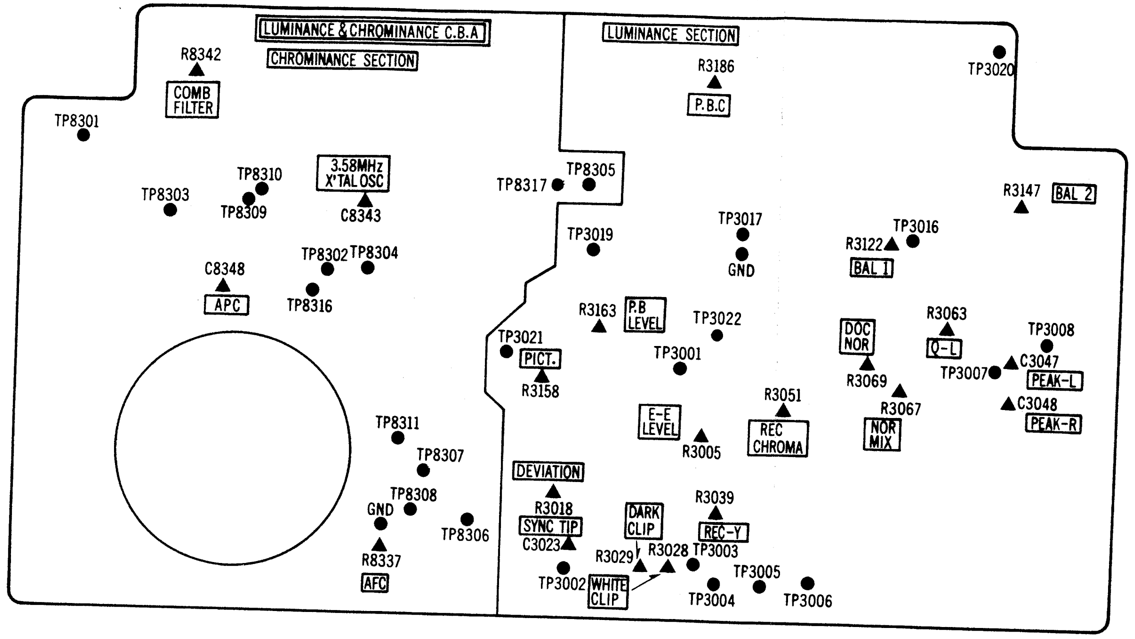

System Control C.B.A.
Audio (1) C.B.A.
Audio (2) C.B.A.


Hi-Fi Audio C.B.A.

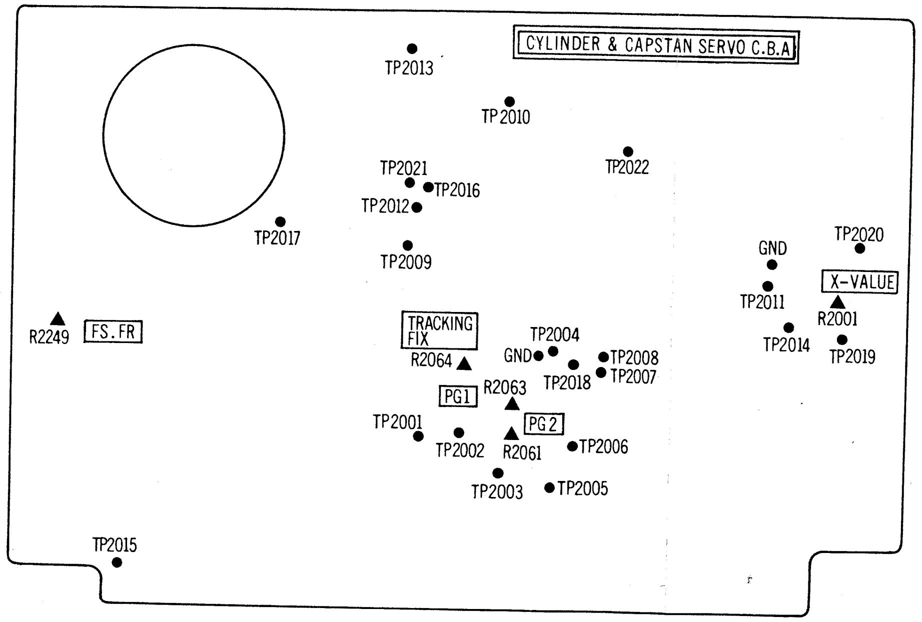
System Control C.B.A. (VEP06190A1)


SYSTEM CONTROL C.B.A
R6103
REEL MOTOR CURRENT
TP6001

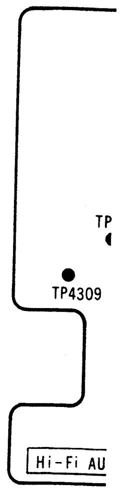
Luminance & Chrominance C.B.A. (VEP03164E)


LUMINANCE & CHROMINANCE C.B.A
CHROMINANCE SECTION
R8342
COMB FILTER
TP8301
TP8310
TP8303
TP8309
3.58MHz X'TAL OSC
C8343
TP8302
TP8304
C8348
APC
TP8316
TP8311
TP8307
TP8308
GND
TP8306
R8337
AFC
LUMINANCE SECTION
R3186
P.B.C
TP3020
TP8317
TP8305
R3147
BAL 2
TP3019
TP3017
GND
R3122
TP3016
BAL 1
R3163
P.B LEVEL
TP3022
TP3021
PICT.
R3158
TP3001
DOC NOR
R3069
R3063
Q-L
TP3008
TP3007
C3047
PEAK-L
C3048
PEAK-R
E-E LEVEL
R3005
R3051
REC CHROMA
R3067
NOR MIX
DEVIATION
R3018
SYNC TIP
C3023
DARK CLIP
R3039
REC-Y
R3029
R3028
TP3003
TP3002
WHITE CLIP
TP3005
TP3004
TP3006

Servo C.B.A. (VEP02164D)

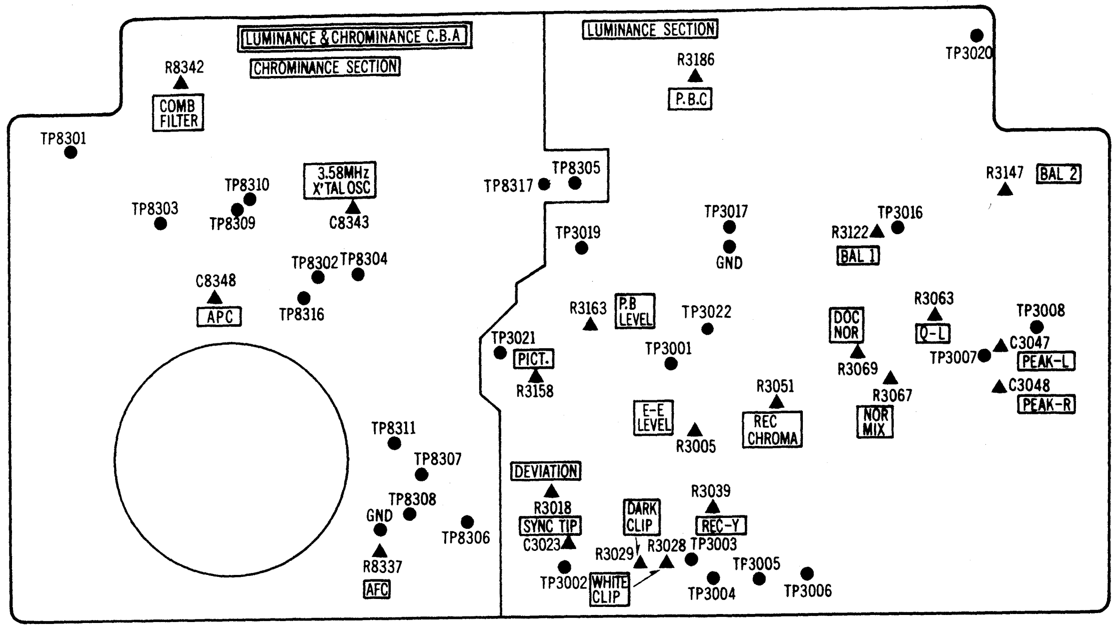

CYLINDER & CAPSTAN SERVO C.B.A
TP2013
TP2010
TP2022
TP2021
TP2016
TP2012
TP2017
TP2009
GND
TP2020
X-VALUE
TP2011
R2001
TP2014
TP2019
R2249
FS.FR
TRACKING FIX
R2064
TP2004
GND
TP2008
TP2018
TP2007
PG1
R2063
PG2
TP2001
TP2002
R2061
TP2006
TP2003
TP2005
TP2015

Hi-Fi

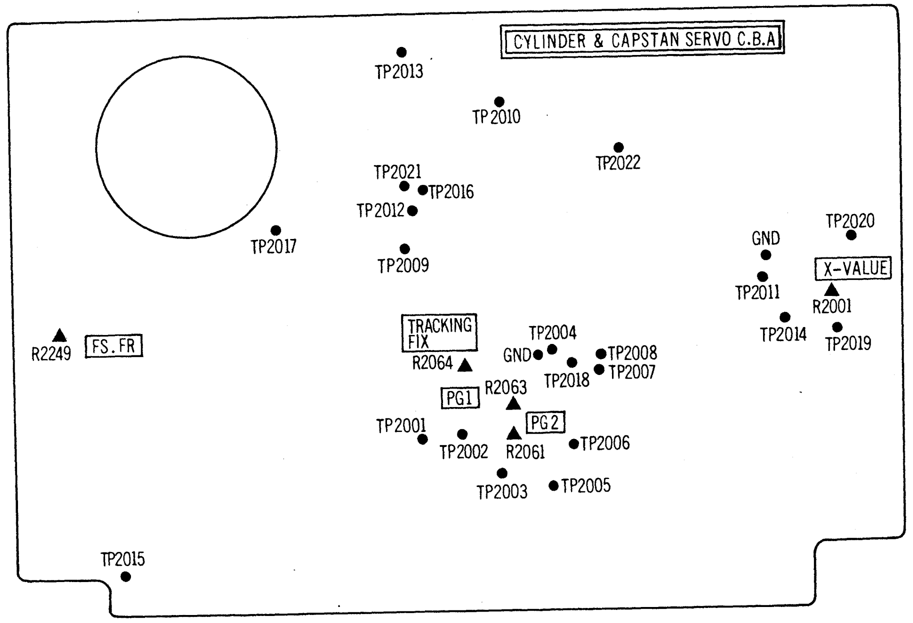

TP4309
Hi-Fi AU

Location of Test Points & Controls

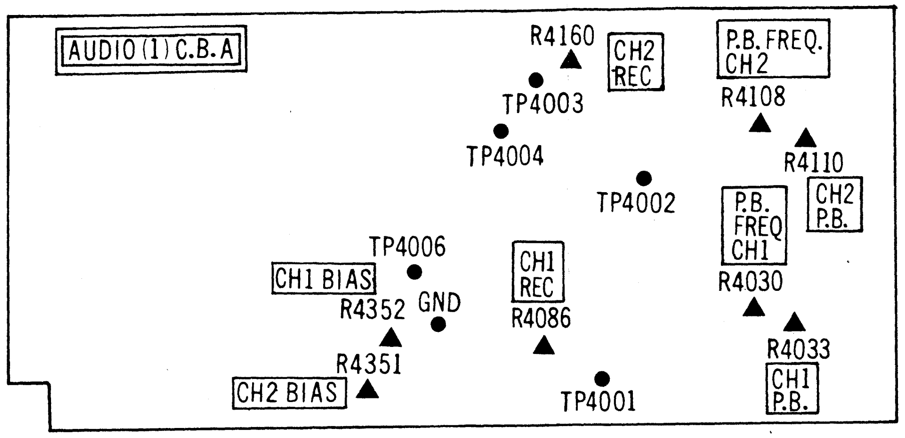
Luminance & Chrominance C.B.A. (VEP03164E)


LUMINANCE & CHROMINANCE C.B.A
CHROMINANCE SECTION
LUMINANCE SECTION
R8342
COMB FILTER
TP8301
TP8310
TP8309
TP8303
3.58MHz X'TAL OSC
C8343
TP8302
TP8304
C8348
APC
TP8316
TP8311
TP8307
TP8308
GND
TP8306
R8337
AFC
TP8317
TP8305
TP3019
TP3021
PICT.
R3158
R3163
P.B LEVEL
TP3022
TP3001
E-E LEVEL
R3005
DEVIATION
R3018
SYNC TIP
C3023
TP3002
WHITE CLIP
DARK CLIP
R3029
R3028
TP3003
R3039
REC-Y
TP3004
TP3005
TP3006
R3186
P.B.C
TP3017
GND
R3051
REC CHROMA
TP3016
R3122
BAL 1
DOC NOR
R3069
R3067
NOR MIX
R3063
Q-L
TP3020
R3147
BAL 2
TP3008
TP3007
C3047
PEAK-L
C3048
PEAK-R

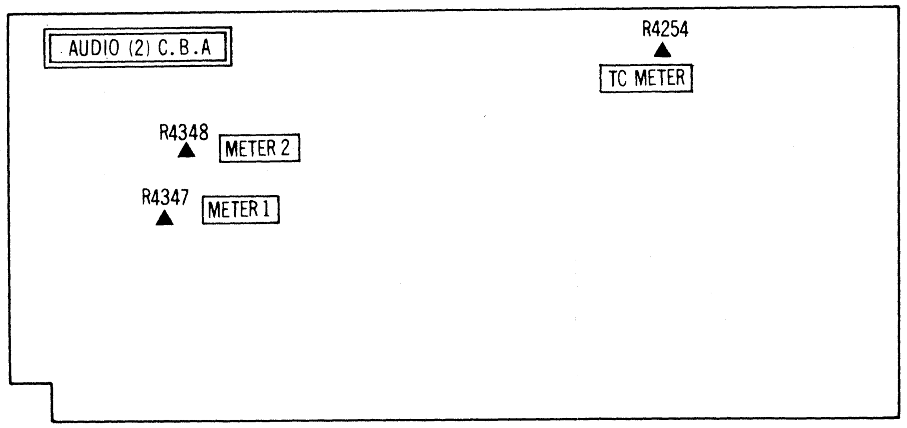
Servo C.B.A. (VEP02164D)


CYLINDER & CAPSTAN SERVO C.B.A
TP2013
TP2010
TP2022
TP2021
TP2016
TP2012
TP2017
TP2009
GND
TP2020
X-VALUE
TP2011
R2001
TP2014
TP2019
R2249
FS.FR
TRACKING FIX
R2064
TP2004
GND
TP2008
TP2018
TP2007
PG1
R2063
PG2
TP2001
TP2002
R2061
TP2006
TP2003
TP2005
TP2015

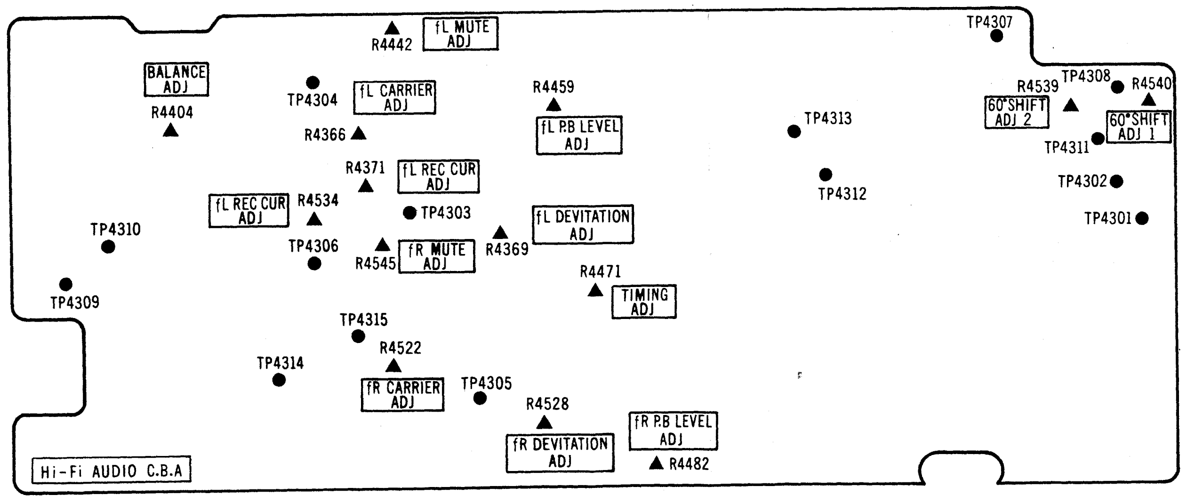
Audio (1) C.B.A. (VEP04093F)


AUDIO (1) C.B.A
R4160
CH2 REC
TP4003
TP4004
P.B. FREQ. CH2
R4108
R4110
TP4002
P.B. FREQ CH1
CH2 P.B.
TP4006
CH1 BIAS
R4352
GND
CH1 REC
R4086
R4030
R4033
R4351
CH2 BIAS
TP4001
CH1 P.B.

Audio (2) C.B.A. (VEP04094F)


AUDIO (2) C.B.A
R4254
TC METER
R4348
METER 2
R4347
METER 1

Hi-Fi Audio C.B.A. (VEP0482B1)


R4442
fL MUTE ADJ
BALANCE ADJ
R4404
TP4304
fL CARRIER ADJ
R4366
R4459
fL P.B LEVEL ADJ
R4371
fL REC CUR ADJ
fL REC CUR ADJ
R4534
TP4303
fL DEVITATION ADJ
TP4310
TP4306
R4545
fR MUTE ADJ
R4369
R4471
TIMING ADJ
TP4309
TP4315
R4522
TP4314
fR CARRIER ADJ
TP4305
R4528
fR DEVITATION ADJ
fR P.B LEVEL ADJ
R4482
Hi-Fi AUDIO C.B.A
TP4313
TP4312
TP4307
R4539
TP4308
R4540
60°SHIFT ADJ 2
60°SHIFT ADJ 1
TP4311
TP4302
TP4301

ORDER NO. VRD-8310-493

Service Manual

Video Cassette Recorder

Panasonic Omnivision II VHS Hi-Fi

AG-6800

Vol. 4

Schematic Diagrams Circuit Board Diagrams

SPECIFICATIONS

Power Source; 110/120/220/240V AC, 60/50Hz
Power Consumption: Approx. 60 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads, helical scanning system
Luminance: FM azimuth recording
Color signal: converted subcarrier phase shift recording
Audio Tracks: 4 channels
NORMAL (CH1/CH2): 2 fixed head tracks
HD (CH1/CH2): 2 rotary head tracks
Tape Format: Tape width 1/2 inch (12.7mm), high density tape
Tape Speed: 1-5/16 i.p.s. (33.35mm/s) (Normal)
Record/Playback Time: 120min. with NV-T120
FF/REW Time: Less than 4.0min with NV-T120
Input Level: Video: VIDEO IN (BNC), 1.0Vp-p, 75Ω
Audio: LINE IN (RCA);
NORMAL (CH1/CH2) −20dB (standard input −8dB), 47kΩ
HD (CH1/CH2)
Output Level: Video: TV Monitor (8 pins), 1.0Vp-p, 75Ω
VIDEO OUT (BNC), 1.0Vp-p, 75Ω
Audio: TV Monitor (8 pins), 0dB, 600Ω
AUDIO OUT (RCA);
NORMAL (CH1/CH2) −8dB, 1kΩ
HD (CH1/CH2)
HEADPHONES,
−16dB ~ −60dB, 8Ω
Rec Remote: (RCA)
Camera Remote: (M2)
Video Horizontal Resolution: Color: more than 240 lines
B/W: more than 300 lines
(on monoscope test pattern)
Audio Frequency Response: 50 ~ 12,000Hz (Normal Audio)
20 ~ 20,000Hz (HD Sound)
Signal-to-Noise Ratio: Video: B/W: better than 46dB
Color: better than 45dB
(Shibasoku noise meter)
Audio: better than 48dB (Normal Audio/ Dolby NR IN)
Audio Dynamic Range: better than 80dB (HD Sound)
Wow and Flutter: less than 0.005% (HD Sound)
Operating Temperature: 41°F ~ 104°F (5°C ~ 40°C)
Operating Humidity: 35% ~ 80%
Weight: 30.9 lbs (14.0kg)
Dimensions: 17″(W) × 15-1/2″(D) × 6-1/4″(H)
430(W) × 392(D) × 158(H)mm
Accessory Supplied: 1 pc. Dust cover

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

* Noise reduction manufactured under license from Dolby Laboratories Licencing Corporation.

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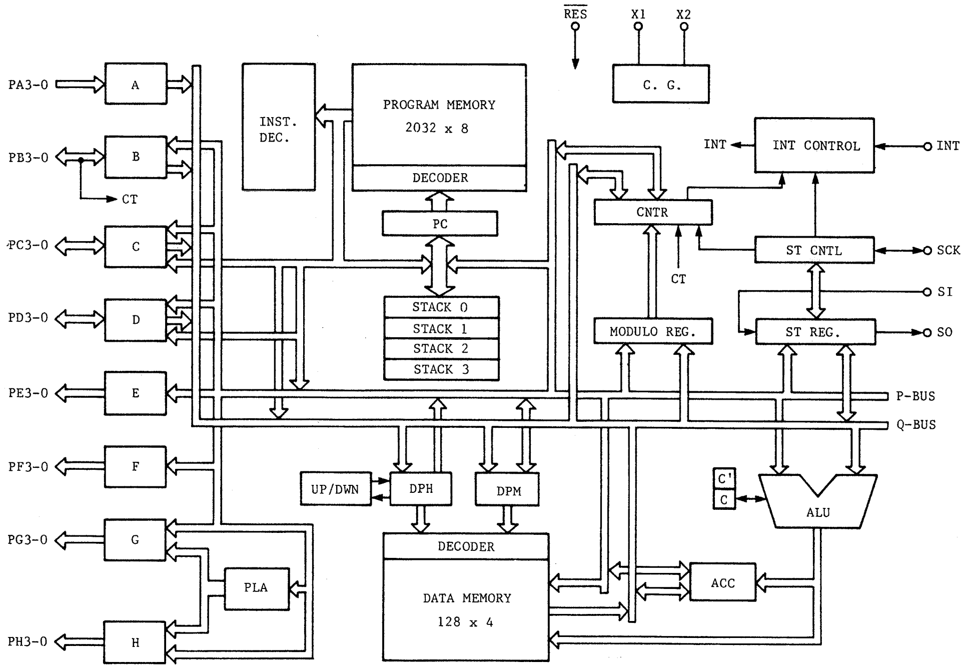
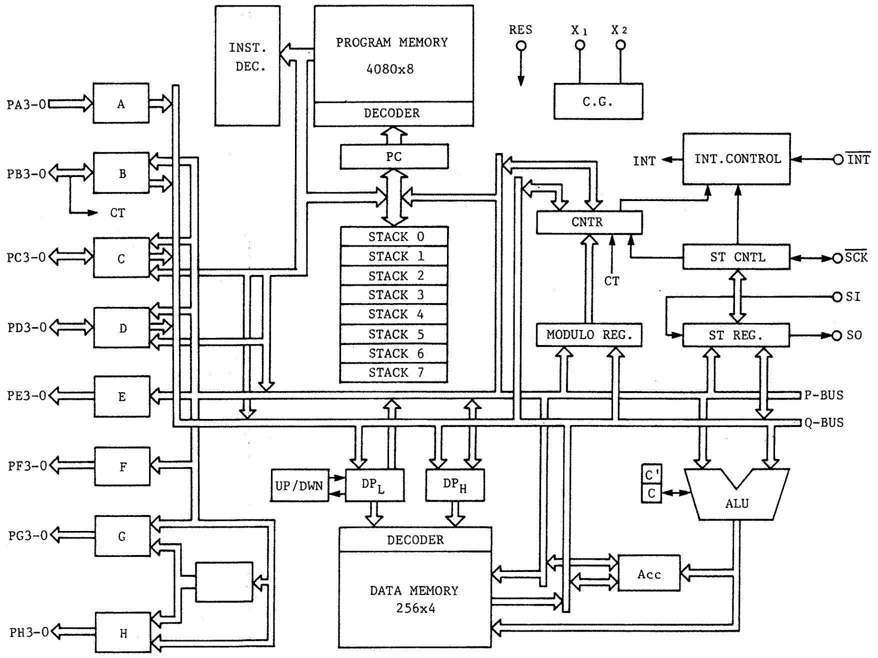
μPD1511AC, μPD1512AC

1 CHIP MICROCOMPUTER

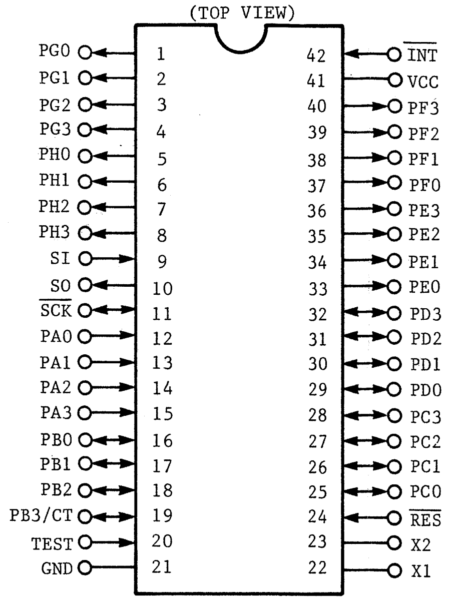
μPD1511AC Block Diagram


RES
X1
X2
C. G.
INST. DEC.
PROGRAM MEMORY
2032 x 8
DECODER
PC
STACK 0
STACK 1
STACK 2
STACK 3
INT
INT CONTROL
INT
CNTR
CT
ST CNTL
SCK
SI
SO
MODULO REG.
ST REG.
P-BUS
Q-BUS
PA3-0
A
PB3-0
B
CT
PC3-0
C
PD3-0
D
PE3-0
E
PF3-0
F
PG3-0
G
PLA
PH3-0
H
UP/DWN
DPH
DPM
C'
C
ALU
DECODER
DATA MEMORY
128 x 4
ACC

μPD1512AC Block Diagram


INST. DEC.
PROGRAM MEMORY
4080x8
DECODER
PC
STACK 0
STACK 1
STACK 2
STACK 3
STACK 4
STACK 5
STACK 6
STACK 7
RES
X1
X2
C.G.
INT
INT.CONTROL
INT
CNTR
CT
ST CNTL
SCK
SI
SO
MODULO REG.
ST REG.
P-BUS
Q-BUS
PA3-0
A
PB3-0
B
CT
PC3-0
C
PD3-0
D
PE3-0
E
PF3-0
F
PG3-0
G
PH3-0
H
UP/DWN
DPL
DPH
C'
C
ALU
DECODER
DATA MEMORY
256x4
Acc

Pin Assignment


(TOP VIEW)
PG0 1
PG1 2
PG2 3
PG3 4
PH0 5
PH1 6
PH2 7
PH3 8
SI 9
SO 10
SCK 11
PA0 12
PA1 13
PA2 14
PA3 15
PB0 16
PB1 17
PB2 18
PB3/CT 19
TEST 20
GND 21
42 INT
41 VCC
40 PF3
39 PF2
38 PF1
37 PF0
36 PE3
35 PE2
34 PE1
33 PE0
32 PD3
31 PD2
30 PD1
29 PD0
28 PC3
27 PC2
26 PC1
25 PC0
24 RES
23 X2
22 X1

SI: SERIAL DATA INPUT
SO: SERIAL DATA OUTPUT
SCK: SERIAL CLOCK IN/OUTPUT
CT: EVENT COUNTER INPUT
INT: INTERRUPT
RES: RESET
X1,X2: CLOCK OSC
TEST: TEST
PA3-0: INPUT PORT A
PB3-0: I/O PORT B
PC3-0: I/O PORT C
PD3-0: I/O PORT D
PE3-0: OUTPUT PORT E
PF3-0: OUTPUT PORT F
PG3-0: OUTPUT PORT G
PH3-0: OUTPUT PORT H

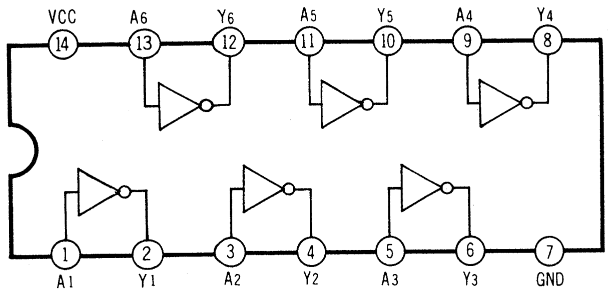
Function Chart

Port Name	Input/Output			When Resetting
INT	I	An Input port for the external interrupt request signal.		
SI	I	An Input port for the serial data.		
SO	O	An Output port for the serial data.		High impedance
SCK	I/O	An Input/Output port for the serial clock signal. This functions as an Input port when the ST register is activated and the external clock signal is used. When the internal clock signal is used, it functions as an Output port during the Shift mode, and as a High impedance during the Timer mode.		Input
PA3-0	I	Input ports A3-0. Input a 4-bit signal, and perform the bit test.		
PB3-0	I/O	Input/Output ports B3-0. Input and output a 4-bit signal, and perform the bit set/reset operation and also the bit test. PB3 can be used as an Input port of the Event Counter.		Input
PC3-0	I/O	Input/Output ports D3-0. Input and output a 4-bit signal, and perform the bit set/reset operation and also the bit test.		Input
PD3-0	I/O	Input/Output ports D3-0. Input and output a 4-bit signal, and perform the bit set/reset operation and the bit test.		Input
PE3-0	O	Output ports E3-0. Output a 4-bit signal and perform the bit set/reset operation.		All ports reset to "1".
PF3-0	O	Output ports F3-0. Output a 4-bit signal, and perform the bit set/reset operation.		All ports reset to "1".
PG3-0	O	Output ports G3-0. Output a 4-bit signal, and perform the bit set/reset operation.	When executing the OPL instruction, PG3-1 and PH3-0 function as Output ports for a 7-bit PLA signal.	All ports reset to "1".
PH3-0	O	Output ports H3-0. Output a 4-bit signal, and perform the bit set/reset operation.		All ports reset to "1".
RES	I	A reset Input port.		
X1,X2		Crystals or RC terminals for generating the internal clock signal. An external clock signal may be fed to X1.		
TEST	I	Input ports for the LSI test. Normally, this is set to the GND level.		

HD7406P

HEX INVERTER BUFFERS/DRIVERS

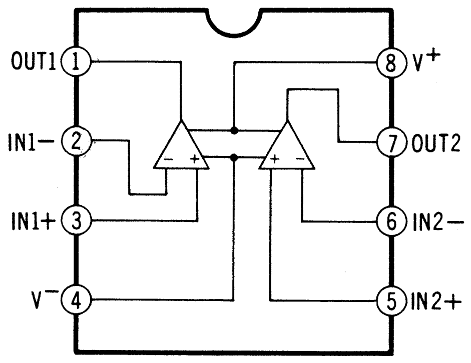
Pin Assignment & Block Diagram


VCC
A6
Y6
A5
Y5
A4
Y4
14
13
12
11
10
9
8
1
2
3
4
5
6
7
A1
Y1
A2
Y2
A3
Y3
GND

μPC358C

OPE-AMPLIFIER

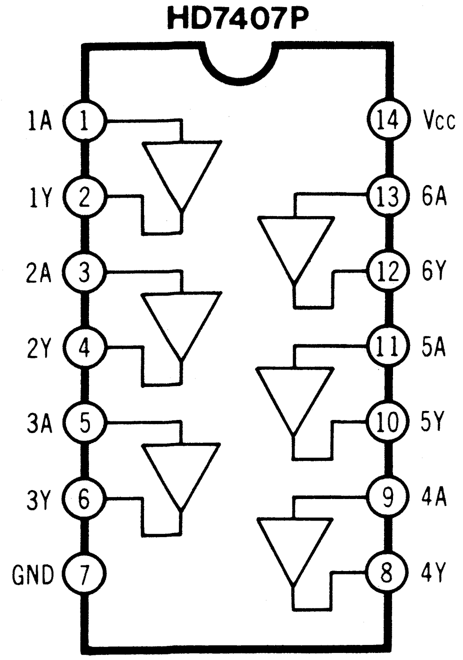
Pin Assignment & Block Diagram


OUT1 1
IN1− 2
IN1+ 3
V− 4
8 V+
7 OUT2
6 IN2−
5 IN2+

HD7407P

HEX BUFFERS/DRIVERS

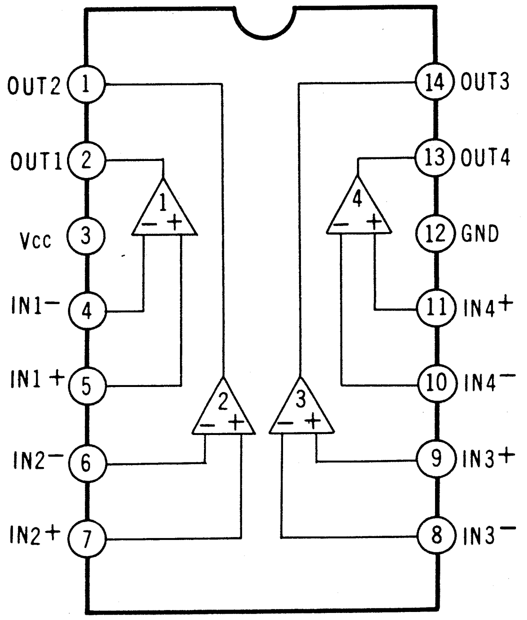
Pin Assignment & Block Diagram


HD7407P
1A 1
1Y 2
2A 3
2Y 4
3A 5
3Y 6
GND 7
14 Vcc
13 6A
12 6Y
11 5A
10 5Y
9 4A
8 4Y

μPC339C, AN6912

QUAD COMPARATOR

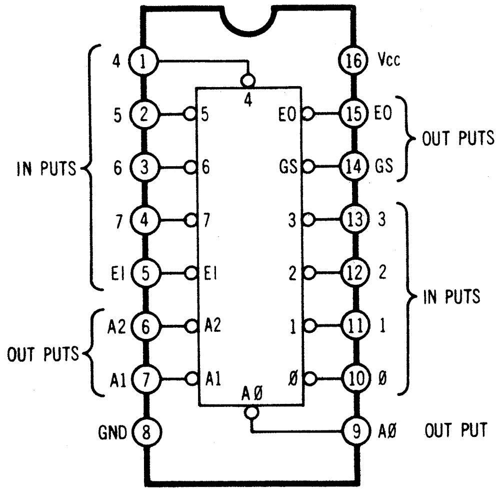
Pin Assignment & Block Diagram


OUT2 1
OUT1 2
Vcc 3
IN1− 4
IN1+ 5
IN2− 6
IN2+ 7
14 OUT3
13 OUT4
12 GND
11 IN4+
10 IN4−
9 IN3+
8 IN3−
1
2
3
4

HD74LS148P

8-LINE-TO-3-LINE OCTAL PRIORITY ENCODER

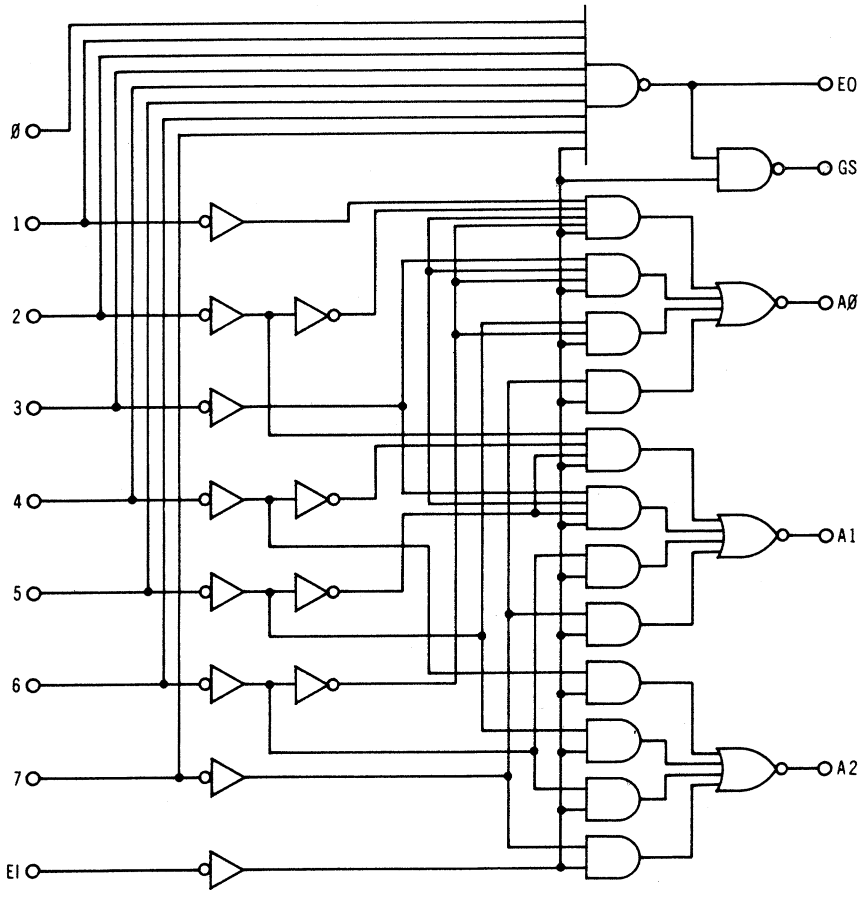
Pin Assignment


IN PUTS
4 1
5 2
6 3
7 4
EI 5
OUT PUTS
A2 6
A1 7
GND 8
16 Vcc
15 EO
14 GS
13 3
12 2
11 1
10 0
9 A0
OUT PUTS
IN PUTS
OUT PUT
4
5
6
7
EI
A2
A1
A0
EO
GS
3
2
1
0

Truth Table

IN PUTS									OUT PUTS				
E1	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	×	×	×	×	×	×	×	×	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	×	×	×	×	×	×	×	L	L	L	L	L	H
L	×	×	×	×	×	L	H	H	L	H	L	L	H
L	×	×	×	×	×	L	H	H	L	H	L	L	H
L	×	×	×	×	L	H	H	H	L	H	H	L	H
L	×	×	×	L	H	H	H	H	H	L	L	L	H
L	×	×	L	H	H	H	H	H	H	L	H	L	H
L	×	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

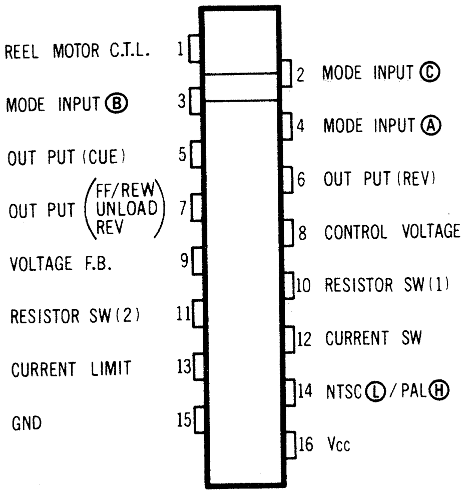
Block Diagram


0
1
2
3
4
5
6
7
EI
EO
GS
A0
A1
A2

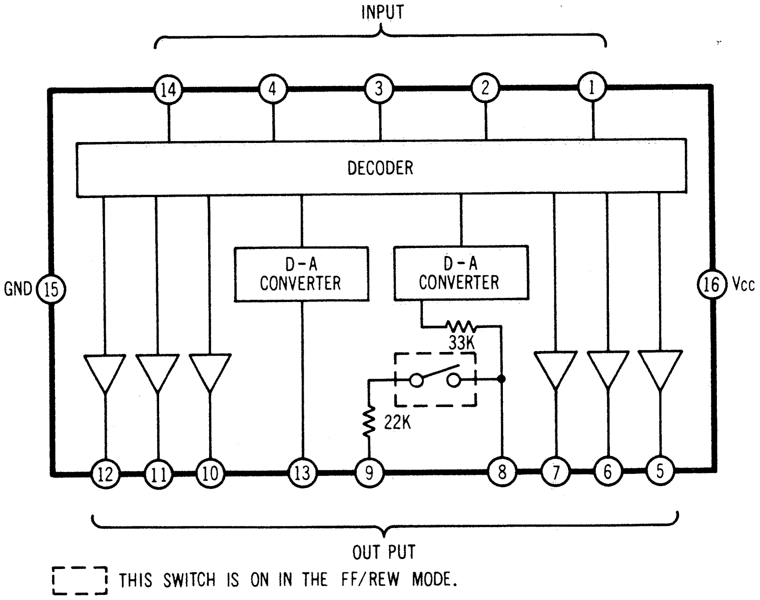
BAL872

REEL MOTOR CONTROL IC

Pin Assignment


REEL MOTOR C.T.L. 1
MODE INPUT Ⓑ 3
OUT PUT (CUE) 5
OUT PUT (FF/REW UNLOAD REV) 7
VOLTAGE F.B. 9
RESISTOR SW (2) 11
CURRENT LIMIT 13
GND 15
2 MODE INPUT Ⓒ
4 MODE INPUT Ⓐ
6 OUT PUT (REV)
8 CONTROL VOLTAGE
10 RESISTOR SW (1)
12 CURRENT SW
14 NTSC Ⓛ / PAL Ⓗ
16 Vcc

Block Diagram


INPUT
⑭
④
③
②
①
DECODER
D-A CONVERTER
D-A CONVERTER
33K
22K
GND ⑮
⑯ Vcc
⑫
⑪
⑩
⑬
⑨
⑧
⑦
⑥
⑤
OUT PUT
THIS SWITCH IS ON IN THE FF/REW MODE.

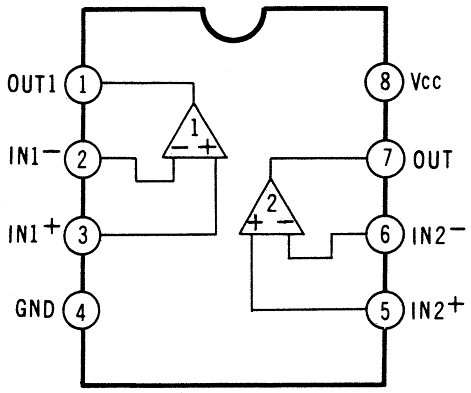
Function Chart

MODE	INPUT					OUTPUT								
	A	B	C	REEL MOTOR CTL	NTSC PAL				CURRENT VOLTAGE	CURRENT FEED BACK	RESISTOR SWITCH-1	RESISTOR SWITCH-2	CURRENT ON	CURRENT LIMIT
	4 PIN	3 PIN	2 PIN	1 PIN	14 PIN	5PIN	6PIN	7PIN	8PIN	9PIN	10PIN	11PIN	12PIN	13PIN
STOP	L	L	L	H	–	H	H	H	0V	OFF	H	L	L	–
FF/REW	L	L	H	H	L	H	H	L	8.0V	ON	H	L	L	–
NORMAL PLAY	L	H	L	H	–	H	H	H	4.4V	OFF	H	L	H	3.7V
FIELD SLOW	L	H	H	H	–	H	H	H	4.0V	OFF	H	L	H	3.7V
STILL				L	–	H	H	H	4.0V	OFF	H	L	H	1.0V
UNLOADING	H	L	L	H	–	H	H	L	7.1V	OFF	H	L	H	4.0V
SPEED UP MODE	H	L	H	H	–	L	H	H	8.0V	OFF	H	L	H	3.7V
FWD x2,x6,x10 REV x1,x2,x6 x10	H	H	L	H	L	H	L	L	7.7V	OFF	H	H	L	–
FWD x1/2 REV x1/2	H	H	H	H	–	H	L	L	5.7V	OFF	L	H	L	–

NJM4556D, AN6558
μPC4588C

DUAL COMPARATOR

Pin Assignment & Block Diagram


OUT1 ①
IN1− ②
IN1+ ③
GND ④
⑧ Vcc
⑦ OUT
⑥ IN2−
⑤ IN2+
1
2
− +
+ −

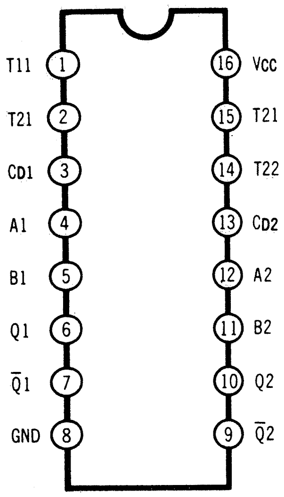
HD14538BP

DUAL PRECISION RETRIGGERABLE/RESETTABLE MONOSTABLE MULTIVIBRATOR

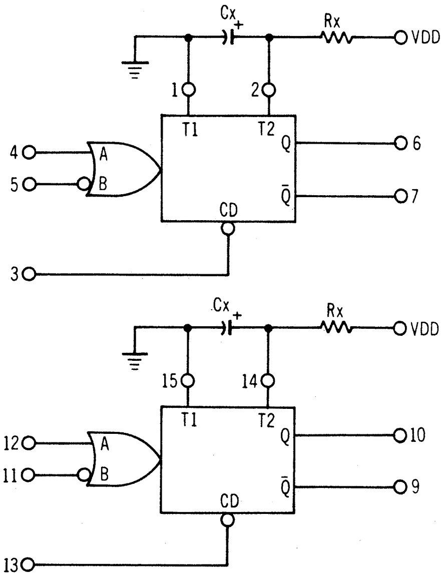
μPD4528BC

DUAL MONOSTABLE MULTIVIBRATOR

Pin Assignment


T11
T21
CD1
A1
B1
Q1
$\bar{Q}$1
GND
Vcc
T21
T22
CD2
A2
B2
Q2
$\bar{Q}$2
1
2
3
4
5
6
7
8
16
15
14
13
12
11
10
9

Block Diagram

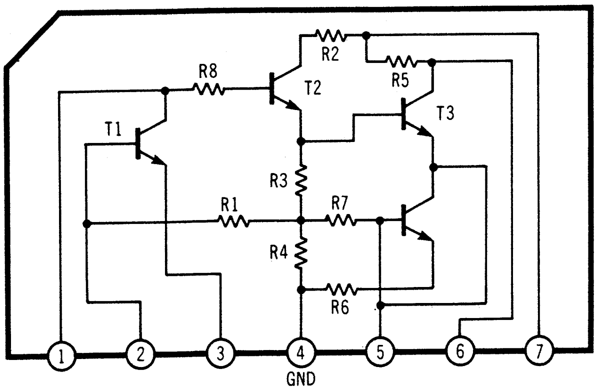

Cx
Rx
VDD
1
2
T1
T2
Q
$\bar{Q}$
CD
A
B
4
5
3
6
7
Cx
Rx
VDD
15
14
T1
T2
Q
$\bar{Q}$
CD
A
B
12
11
13
10
9

Rx AND Cx ARE EXTERNAL COMPONENTS
GND = PIN 8 VCC = PIN 16

AN360

LOW NOISE PRE-AMPLIFIER

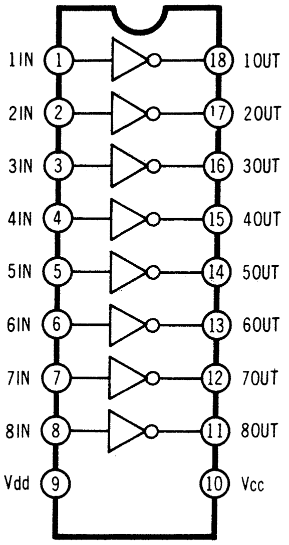
Pin Assignment & Block Diagram


R2
R8
T2
R5
T3
T1
R3
R1
R7
R4
R6
1
2
3
4
GND
5
6
7

AN6873

OCT. INVERTER

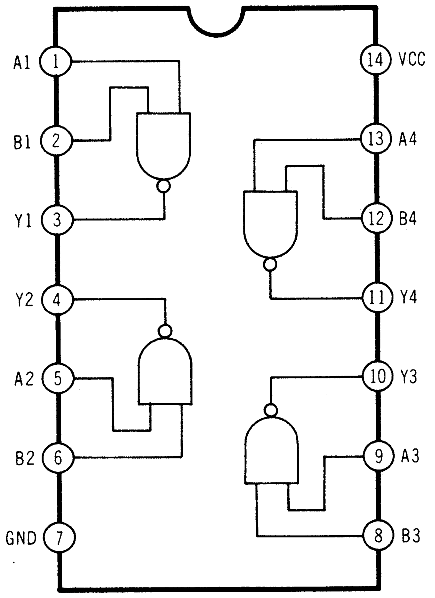
Pin Assignment & Block Diagram


1IN
2IN
3IN
4IN
5IN
6IN
7IN
8IN
Vdd
1OUT
2OUT
3OUT
4OUT
5OUT
6OUT
7OUT
8OUT
Vcc
1
2
3
4
5
6
7
8
9
18
17
16
15
14
13
12
11
10

μPD4011BC

QUAD 2 INPUT NAND GATE

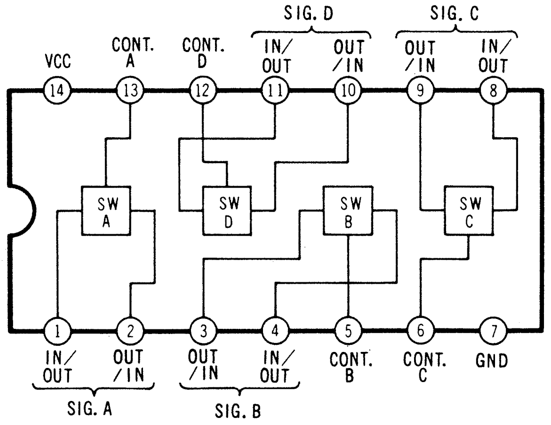
Pin Assignment & Block Diagram


A1 1
B1 2
Y1 3
Y2 4
A2 5
B2 6
GND 7
14 VCC
13 A4
12 B4
11 Y4
10 Y3
9 A3
8 B3

μPD4066BC

QUAD BILATERAL SWITCH

Pin Assignment & Block Diagram


SIG. D
SIG. C
VCC
CONT. A
CONT. D
IN/OUT
OUT/IN
OUT/IN
IN/OUT
14
13
12
11
10
9
8
SW A
SW D
SW B
SW C
1
2
3
4
5
6
7
IN/OUT
OUT/IN
OUT/IN
IN/OUT
CONT. B
CONT. C
GND
SIG. A
SIG. B

Truth Table

CONTROL	SWITCH
H	CLOSE
L	OPEN

μPD4013BC

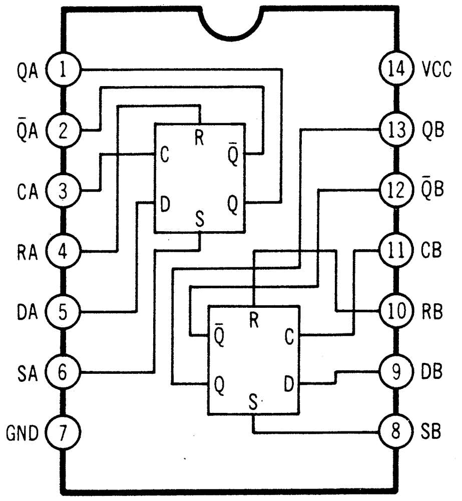
DUAL COMPARATOR

Truth Table

INPUT				OUT PUT	
CLOCK	DATA	SET	RESET	Qn+1	Q̄n+1
↑	L	L	L	L	H
↑	H	L	L	H	L
↓	x	L	L	Qn	Q̄n
x	x	L	H	L	H
x	x	H	L	H	L
x	x	H	H	H	H

H:HIGH LEVEL L:LOW LEVEL x:H OR L

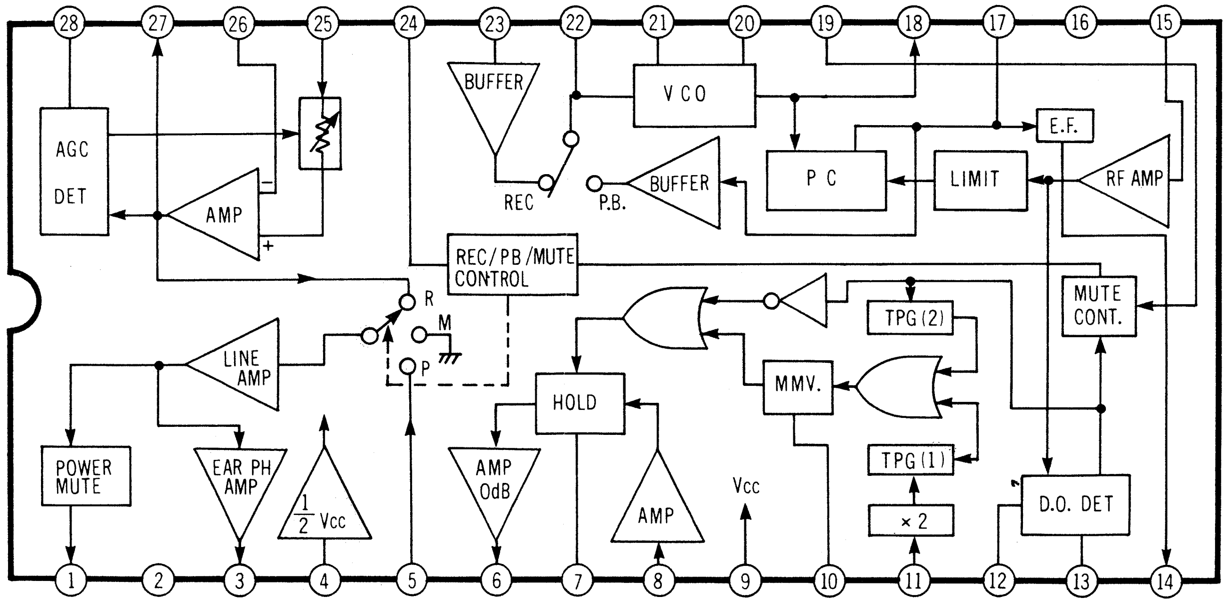
Pin Assignment & Block Diagram


QA 1
Q̄A 2
CA 3
RA 4
DA 5
SA 6
GND 7
14 VCC
13 QB
12 Q̄B
11 CB
10 RB
9 DB
8 SB
C
R
Q̄
D
S
Q
Q̄
R
C
Q
S
D

AN6391S

Hi-Fi COMPRESSOR/EXPANDER

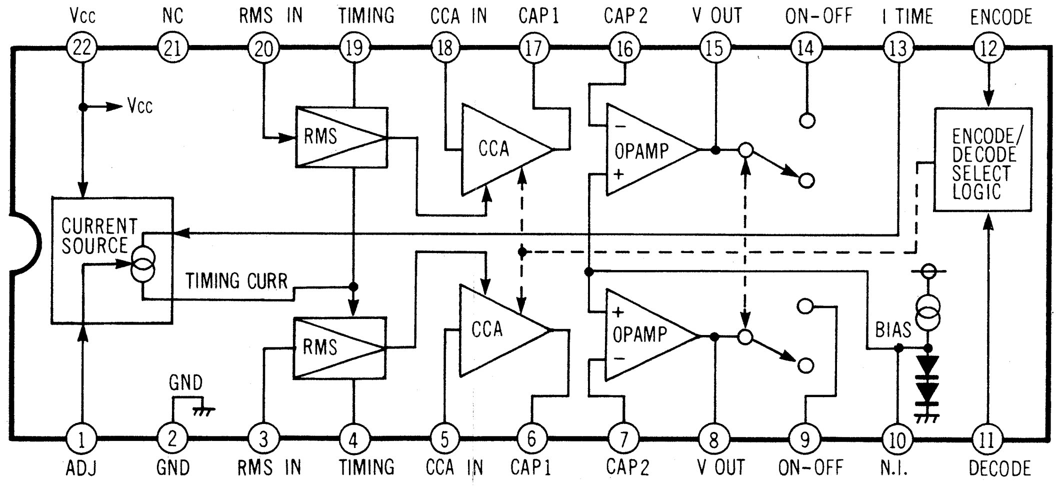
Pin Assignment & Block Diagram


28
27
26
25
24
23
22
21
20
19
18
17
16
15
AGC DET
AMP
BUFFER
VCO
REC
P.B.
BUFFER
P C
LIMIT
E.F.
RF AMP
REC/PB/MUTE CONTROL
R
M
P
LINE AMP
TPG (2)
MUTE CONT.
MMV.
HOLD
TPG (1)
× 2
D.O. DET
POWER MUTE
EAR PH AMP
1/2 Vcc
AMP 0dB
AMP
Vcc
1
2
3
4
5
6
7
8
9
10
11
12
13
14

AN6291S

Hi-Fi MODULATOR/DEMODULATOR

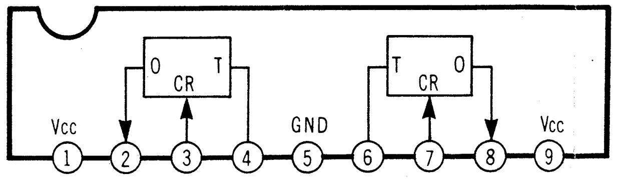
Pin Assignment & Block Diagram


Vcc
NC
RMS IN
TIMING
CCA IN
CAP1
CAP2
V OUT
ON-OFF
I TIME
ENCODE
22
21
20
19
18
17
16
15
14
13
12
Vcc
RMS
CCA
OPAMP
ENCODE/DECODE SELECT LOGIC
CURRENT SOURCE
TIMING CURR
RMS
CCA
OPAMP
BIAS
GND
1
2
3
4
5
6
7
8
9
10
11
ADJ
GND
RMS IN
TIMING
CCA IN
CAP1
CAP2
V OUT
ON-OFF
N.I.
DECODE

BA236

DUAL MONOSTABLE MULTIVIBRATOR

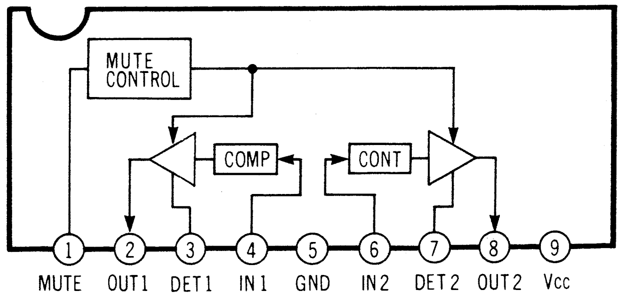
Pin Assignment & Block Diagram


O
T
CR
T
O
CR
Vcc
GND
Vcc
1
2
3
4
5
6
7
8
9

BA6138

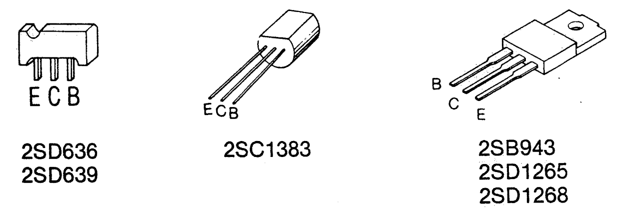
1/2 COMPRESSION AMPLIFIER

Pin Assignment & Block Diagram

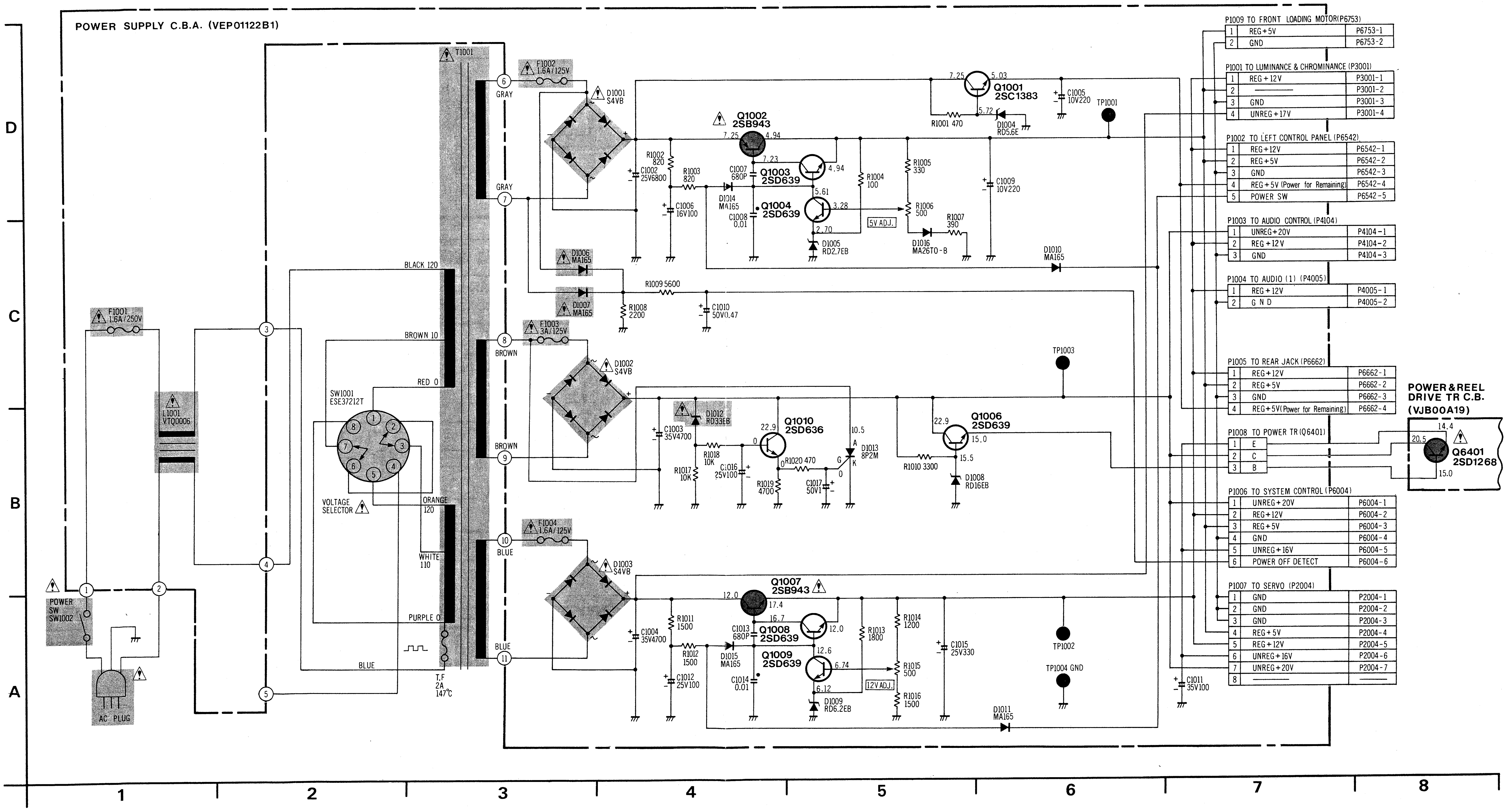

MUTE CONTROL
COMP
CONT
1
2
3
4
5
6
7
8
9
MUTE
OUT1
DET1
IN1
GND
IN2
DET2
OUT2
Vcc

POWER SUPPLY SCHEMATIC DIAGRAM

Power Supply C.B.A. Transistors Information



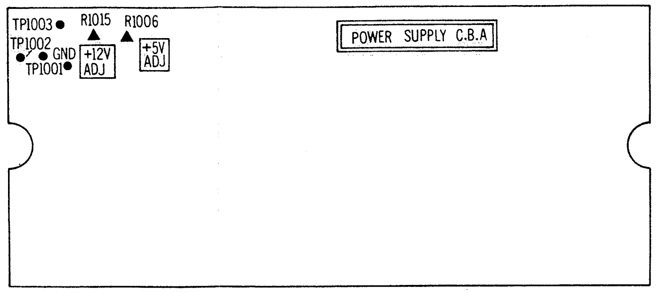
E C B
2SD636
2SD639
E C B
2SC1383
B
C
E
2SB943
2SD1265
2SD1268



POWER SUPPLY C.B.A. (VEP01122B1)
D
C
B
A
1
2
3
4
5
6
7
8
T1001
F1001 1.6A/250V
L1001 VTQ0006
POWER SW SW1002
AC PLUG
SW1001 ESE37212T
VOLTAGE SELECTOR
BLACK 120
BROWN 10
RED 0
ORANGE 120
WHITE 110
PURPLE 0
BLUE
T.F 2A 147°C
F1002 1.6A/125V
F1003 3A/125V
F1004 1.6A/125V
GRAY
BROWN
BLUE
D1001 S4VB
D1002 S4VB
D1003 S4VB
D1006 MA165
D1007 MA165
R1009 5600
R1008 2200
C1010 50V0.47
Q1002 2SB943
Q1003 2SD639
Q1004 2SD639
Q1001 2SC1383
R1002 820
C1002 25V6800
R1003 820
C1006 16V100
C1007 680P
D1014 MA165
C1008 0.01
R1004 100
R1005 330
R1006 500
5V ADJ.
D1005 RD2.7EB
D1016 MA26TO-B
R1007 390
C1009 10V220
R1001 470
D1004 RD5.6E
C1005 10V220
TP1001
D1010 MA165
7.25
4.94
7.23
5.61
3.28
2.70
5.03
5.72
D1012 RD33EB
C1003 35V4700
R1018 10K
R1017 10K
C1016 25V100
Q1010 2SD636
22.9
0
R1020 470
R1019 4700
C1017 50V1
D1013 8P2M
10.5
A
G
K
Q1006 2SD639
22.9
15.0
15.5
R1010 3300
D1008 RD16EB
TP1003
Q1007 2SB943
12.0
17.4
16.7
Q1008 2SD639
Q1009 2SD639
12.6
6.74
6.12
C1004 35V4700
R1011 1500
C1013 680P
R1012 1500
D1015 MA165
C1012 25V100
C1014 0.01
D1009 RD6.2EB
R1013 1800
R1014 1200
R1015 500
12V ADJ.
R1016 1500
C1015 25V330
D1011 MA165
TP1002
TP1004 GND
C1011 35V100
P1009 TO FRONT LOADING MOTOR(P6753)
1 REG+5V P6753-1
2 GND P6753-2
P1001 TO LUMINANCE & CHROMINANCE (P3001)
1 REG+12V P3001-1
2 ——— P3001-2
3 GND P3001-3
4 UNREG+17V P3001-4
P1002 TO LEFT CONTROL PANEL (P6542)
1 REG+12V P6542-1
2 REG+5V P6542-2
3 GND P6542-3
4 REG+5V (Power for Remaining) P6542-4
5 POWER SW P6542-5
P1003 TO AUDIO CONTROL (P4104)
1 UNREG+20V P4104-1
2 REG+12V P4104-2
3 GND P4104-3
P1004 TO AUDIO (1) (P4005)
1 REG+12V P4005-1
2 GND P4005-2
P1005 TO REAR JACK (P6662)
1 REG+12V P6662-1
2 REG+5V P6662-2
3 GND P6662-3
4 REG+5V(Power for Remaining) P6662-4
P1008 TO POWER TR (Q6401)
1 E
2 C
3 B
P1006 TO SYSTEM CONTROL (P6004)
1 UNREG+20V P6004-1
2 REG+12V P6004-2
3 REG+5V P6004-3
4 GND P6004-4
5 UNREG+16V P6004-5
6 POWER OFF DETECT P6004-6
P1007 TO SERVO (P2004)
1 GND P2004-1
2 GND P2004-2
3 GND P2004-3
4 REG+5V P2004-4
5 REG+12V P2004-5
6 UNREG+16V P2004-6
7 UNREG+20V P2004-7
8 ——— ———
POWER & REEL DRIVE TR C.B. (VJB00A19)
14.4
20.5
15.0
Q6401 2SD1268

POWER SUPPLY C.B.A. (VEP01122B1) & SMALL BOARD.

Power Supply C.B.A. (VEP01122B1)	
Q1001	A-2
Q1002	A-2
Q1003	A-2
Q1004	A-2
Q1006	B-3
Q1007	C-3
Q1008	B-3
Q1009	B-3
Q1010	B-3

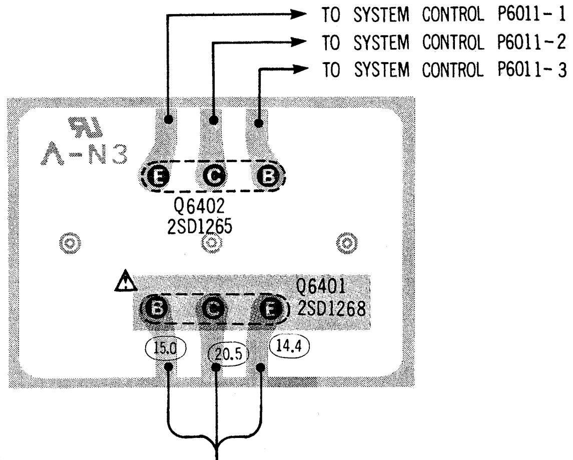

TP1003
R1015
R1006
TP1002
GND
TP1001
+12V ADJ
+5V ADJ
POWER SUPPLY C.B.A

TO P3001
P1001 (LUIMINANCE & CHROMINANCE)

1	REG +12V
2	———
3	GND
4	UNREG+17V

TO P6542
P1002 (LEFT CONTROL PANEL)

1	REG +12V
2	REG +5V
3	GND
4	REG+5V(REMAINING POWER)
5	POWER SW


TO SYSTEM CONTROL P6011-1
TO SYSTEM CONTROL P6011-2
TO SYSTEM CONTROL P6011-3
A-N3
E C B
Q6402
2SD1265
B C E
Q6401
2SD1268
15.0
20.5
14.4

P1008 TO Q6401 (POWER TR)

1	E
2	C
3	B

P1009 TO P6753 (LOADING MOTOR)

1	REG +5V
2	GND

P1003 TO P4104 (AUDIO CONTROL)

1	UNREG +20V
2	REG +12V
3	GND

P1004 TO P4005 (AUDIO)

1	REG +12V
2	GND

P1005 TO P6662 (REAR JACK)

1	REG + 12V
2	REG + 5V
3	GND
4	REG +5V

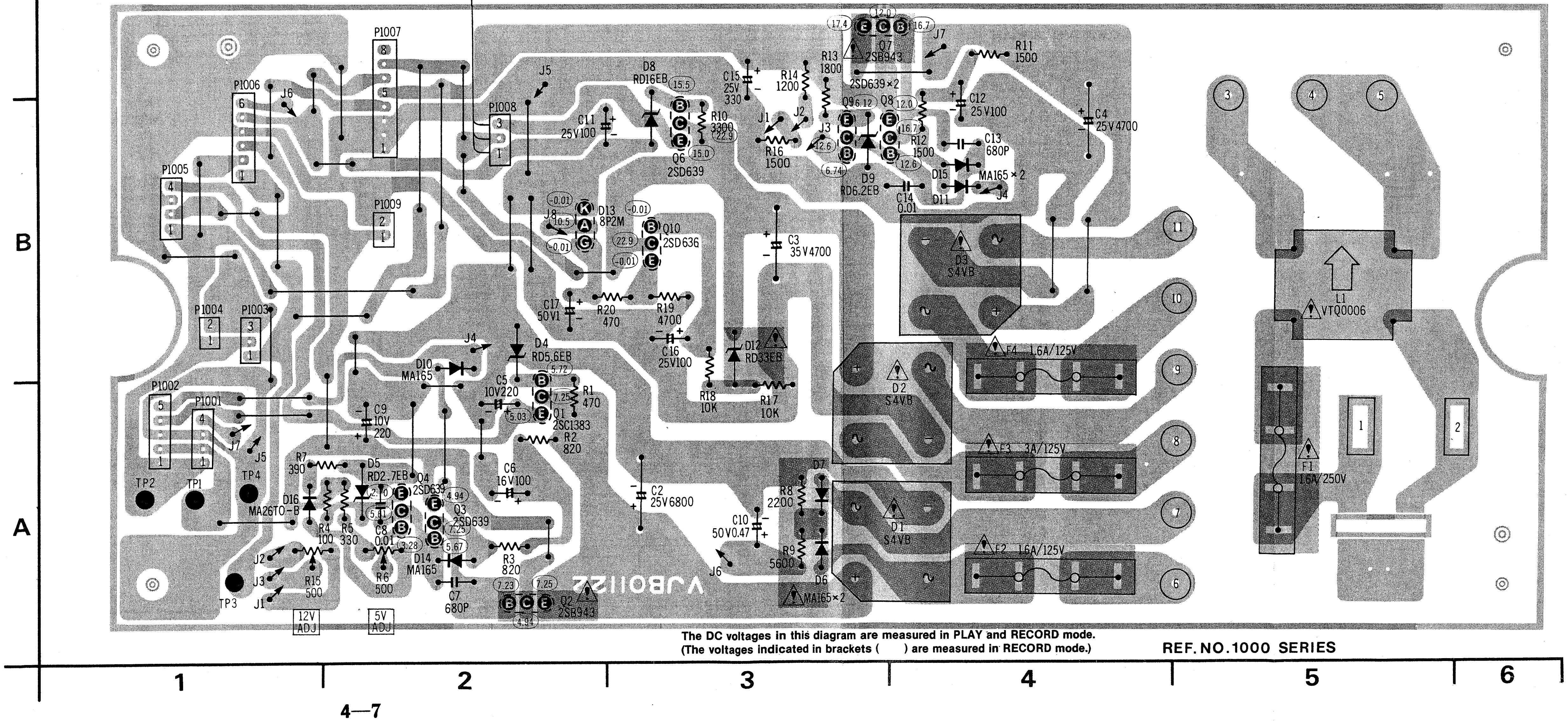
P1006 TO P6004 (SYSTEM CONTROL)

1	UNREG + 20V
2	REG +12V
3	REG +5V
4	GND
5	UNREG +16V
6	POWER OFF DETECT

P1007 TO P2004 (SERVO)

1	GND
2	GND
3	GND
4	REG + 5V
5	REG + 12V
6	UNREG+16V
7	UNREG+20V
8	———

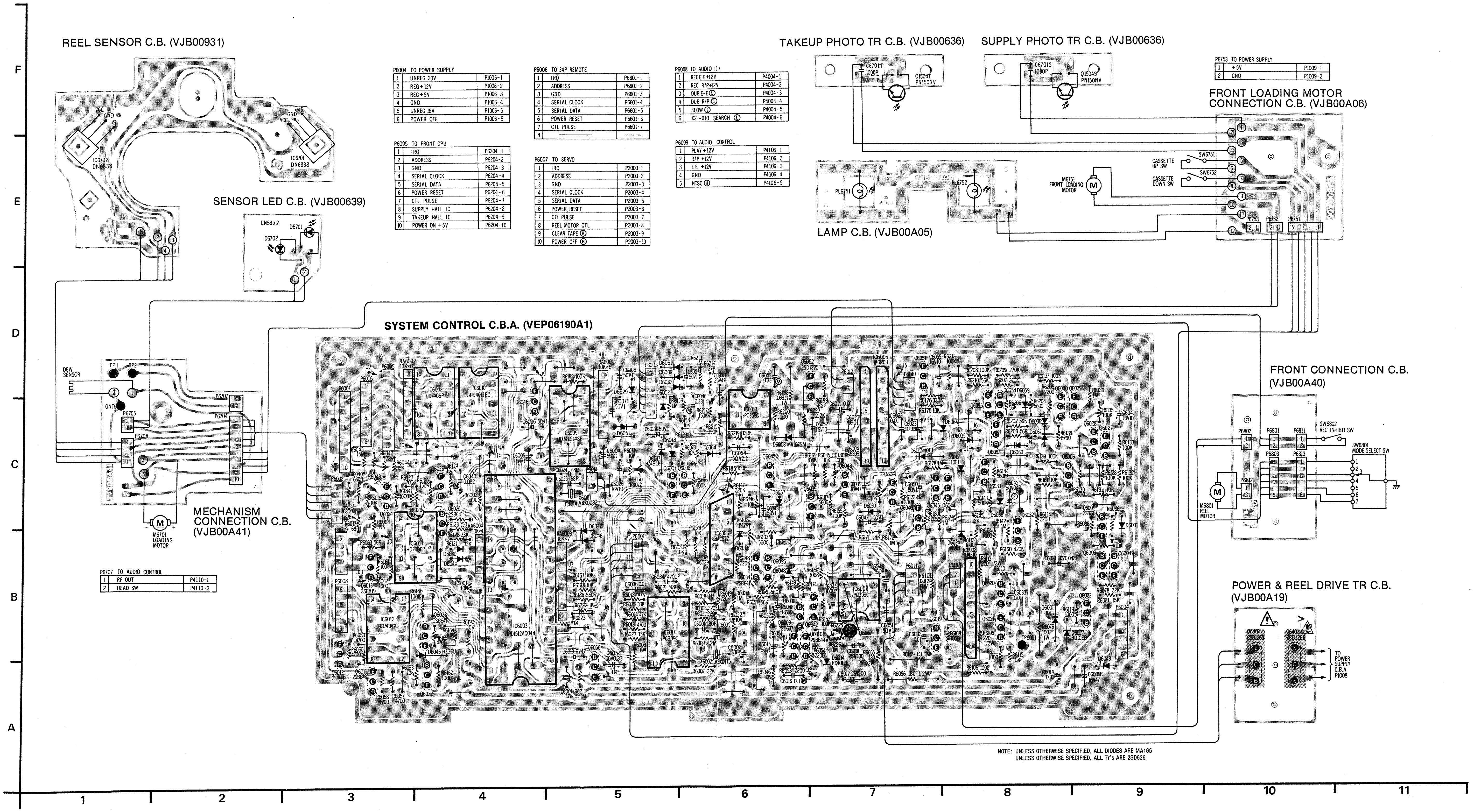
POWER SUPPLY C.B.A. (VEP01122B1)


D
C
B
A
1
2
3
4
5
6
P1007
P1006
J6
P1008
J5
D8
RD16EB
C11 25V100
Q6 2SD639
R10 3300
C15 25V 330
R14 1200
R13 1800
Q7 2SB943
J7
R11 1500
2SD639×2
Q9 Q8
C12 25V100
C4 25V4700
J1 J2 J3
R16 1500
R12 1500
C13 680P
D9 RD6.2EB
D15
MA165×2
C14 0.01
D11
J4
P1005
P1009
J8
D13 8P2M
Q10 2SD636
C3 35V4700
D3 S4VB
L1 VTQ0006
C17 50V1
R20 470
R19 4700
C16 25V100
D12 RD33EB
P1004
P1003
J4
D4 RD5.6EB
D10 MA165
C5 10V220
R1 470
Q1 2SC1383
R2 820
R18 10K
R17 10K
D2 S4VB
F4 1.6A/125V
F3 3A/125V
F2 1.6A/125V
F1 1.6A/250V
P1002
P1001
J7
J5
C9 10V 220
R7 390
D5 RD2.7EB
Q4 2SD639
Q3 2SD639
C6 16V100
C2 25V6800
R8 2200
C10 50V0.47
D7
D1 S4VB
TP2 TP1 TP4 TP3
D16 MA26TO-B
R4 100
R5 330
C8 0.01
D14 MA165
R3 820
R9 5600
D6
MA165×2
J2 J3 J1
R15 500
R6 500
C7 680P
Q2 2SB943
VJB0112
12V ADJ
5V ADJ
1 2 3 4 5 6 7 8 9 10 11
17.4 12.0 16.7 15.5 22.9 15.0 6.12 12.6 6.74 12.6 16.7 12.0
-0.01 10.5 -0.01 -0.01 22.9 -0.01
5.72 7.25 5.03 2.10 5.31 4.94 7.25 3.28 5.67 7.23 7.25 4.94

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

REF. NO.1000 SERIES

SYSTEM CONTROL C.B.A. & SMALL BOARDS.


F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
REEL SENSOR C.B. (VJB00931)
VCC
GND
S
IC6702
DN6838
IC6701
DN6838
SENSOR LED C.B. (VJB00639)
LN58×2
D6701
D6702
TAKEUP PHOTO TR C.B. (VJB00636)
C6701T
1000P
Q1504T
PN150NV
SUPPLY PHOTO TR C.B. (VJB00636)
C6701S
1000P
Q1504S
PN150NV
FRONT LOADING MOTOR
CONNECTION C.B. (VJB00A06)
CASSETTE UP SW
SW6751
CASSETTE DOWN SW
SW6752
M6751
FRONT LOADING MOTOR
P6753
P6752
P6751
LAMP C.B. (VJB00A05)
PL6751
PL6752
SYSTEM CONTROL C.B.A. (VEP06190A1)
VJB06190
DEW SENSOR
TP1
TP2
GND
P6705
P6707
P6704
P6708
MECHANISM
CONNECTION C.B.
(VJB00A41)
M6701
LOADING
MOTOR
IC6002
HD7406P
IC6003
μPD4011BC
IC6001
HD7406P
IC6012
HD7407P
IC6003
μPD1512AC044
IC6006
AN6238
IC6005
BA6209
FRONT CONNECTION C.B.
(VJB00A40)
SW6802
REC INHIBIT SW
SW6801
MODE SELECT SW
P6802
P6801
P6811
P6803
P6813
M6801
REEL
MOTOR
POWER & REEL DRIVE TR C.B.
(VJB00A19)
Q6402
2SD1265
Q6401
2SD1266
TO POWER SUPPLY C.B.A P1008

P6004 TO POWER SUPPLY

1	UNREG 20V	P1006-1
2	REG+12V	P1006-2
3	REG+5V	P1006-3
4	GND	P1006-4
5	UNREG 16V	P1006-5
6	POWER OFF	P1006-6

P6005 TO FRONT CPU

1	$\overline{\text{IRQ}}$	P6204-1
2	$\overline{\text{ADDRESS}}$	P6204-2
3	GND	P6204-3
4	SERIAL CLOCK	P6204-4
5	SERIAL DATA	P6204-5
6	POWER RESET	P6204-6
7	CTL PULSE	P6204-7
8	SUPPLY HALL IC	P6204-8
9	TAKEUP HALL IC	P6204-9
10	POWER ON +5V	P6204-10

P6006 TO 34P REMOTE

1	$\overline{\text{IRQ}}$	P6601-1
2	$\overline{\text{ADDRESS}}$	P6601-2
3	GND	P6601-3
4	SERIAL CLOCK	P6601-4
5	SERIAL DATA	P6601-5
6	POWER RESET	P6601-6
7	CTL PULSE	P6601-7
8	———	———

P6007 TO SERVO

1	$\overline{\text{IRQ}}$	P2003-1
2	$\overline{\text{ADDRESS}}$	P2003-2
3	GND	P2003-3
4	SERIAL CLOCK	P2003-4
5	SERIAL DATA	P2003-5
6	POWER RESET	P2003-6
7	CTL PULSE	P2003-7
8	REEL MOTOR CTL	P2003-8
9	CLEAR TAPE Ⓗ	P2003-9
10	POWER OFF Ⓗ	P2003-10

P6008 TO AUDIO (1)

1	REC E-E+12V	P4004-1
2	REC R/P+12V	P4004-2
3	DUB E-E Ⓛ	P4004-3
4	DUB R/P Ⓛ	P4004 4
5	SLOW Ⓛ	P4004-5
6	X2~X10 SEARCH Ⓛ	P4004-6

P6009 TO AUDIO CONTROL

1	PLAY +12V	P4106 1
2	R/P +12V	P4106 2
3	E-E +12V	P4106 3
4	GND	P4106 4
5	NTSC Ⓗ	P4106-5

P6753 TO POWER SUPPLY

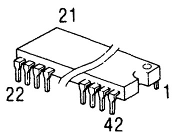
1	+5V	P1009-1
2	GND	P1009-2

P6707 TO AUDIO CONTROL

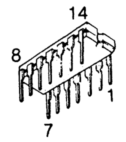
1	RF OUT	P4110-1
2	HEAD SW	P4110-3

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636

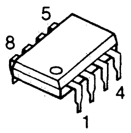
System Control C.B.A. ICs & Transistors Information



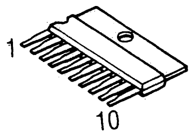
µPD1512AC



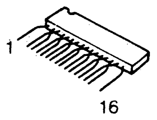
µPC339C
HD7406P
HD7407P
µPD4011BC



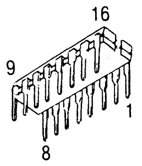
µPC358C



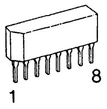
BA6209



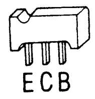
BAL872



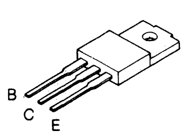
HD74LS148P



PU4310



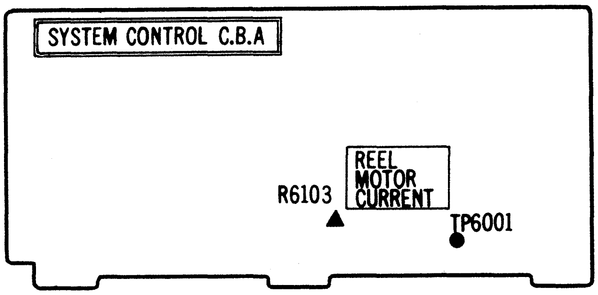
2SB641
2SB643
2SB644
2SB819
2SD636
2SD637
2SD638



2SD1275

Power & Reel Driver Tr C.B. (VJB00A19)	
Q6401	A-10
Q6402	A-10

System Control C.B.A. (VEP06190A1)			
Q6003	B-9	Q6040	C-7
Q6004	B-9	Q6041	C-7
Q6005	C-9	Q6042	B-6
Q6006	C-8	Q6044	C-8
Q6007	C-5	Q6045	C-7
Q6008	C-6	Q6046	C-4
Q6009	B-6	Q6047	C-6
Q6010	B-6	Q6048	C-7
Q6011	A-3	Q6051	D-7
Q6012	B-3	Q6052	D-6
Q6013	B-3	Q6053	C-8
Q6019	B-7	Q6054	C-8
Q6020	B-8	Q6055	C-8
Q6021	B-8	Q6056	B-5
Q6022	B-9	Q6057	B-7
Q6024	C-3		
Q6025	C-4	IC6001	B-5
Q6026	C-4	IC6002	C-4
Q6027	C-9	IC6003	B-4
Q6028	C-9	IC6004	C-7
Q6029	C-8	IC6005	C-7
Q6030	C-8	IC6006	C-6
Q6032	B-8	IC6007	B-7
Q6033	C-8	IC6008	B-8
Q6034	B-6	IC6009	C-5
Q6035	B-6	IC6010	C-4
Q6036	B-6	IC6011	B-4
Q6037	A-4	IC6012	B-3
Q6038	B-4	IC6013	C-6
Q6039	C-6		


SYSTEM CONTROL C.B.A
REEL
MOTOR
CURRENT
R6103
TP6001

SYSTEM CONTROL ICs DC VOLTAGE CHART

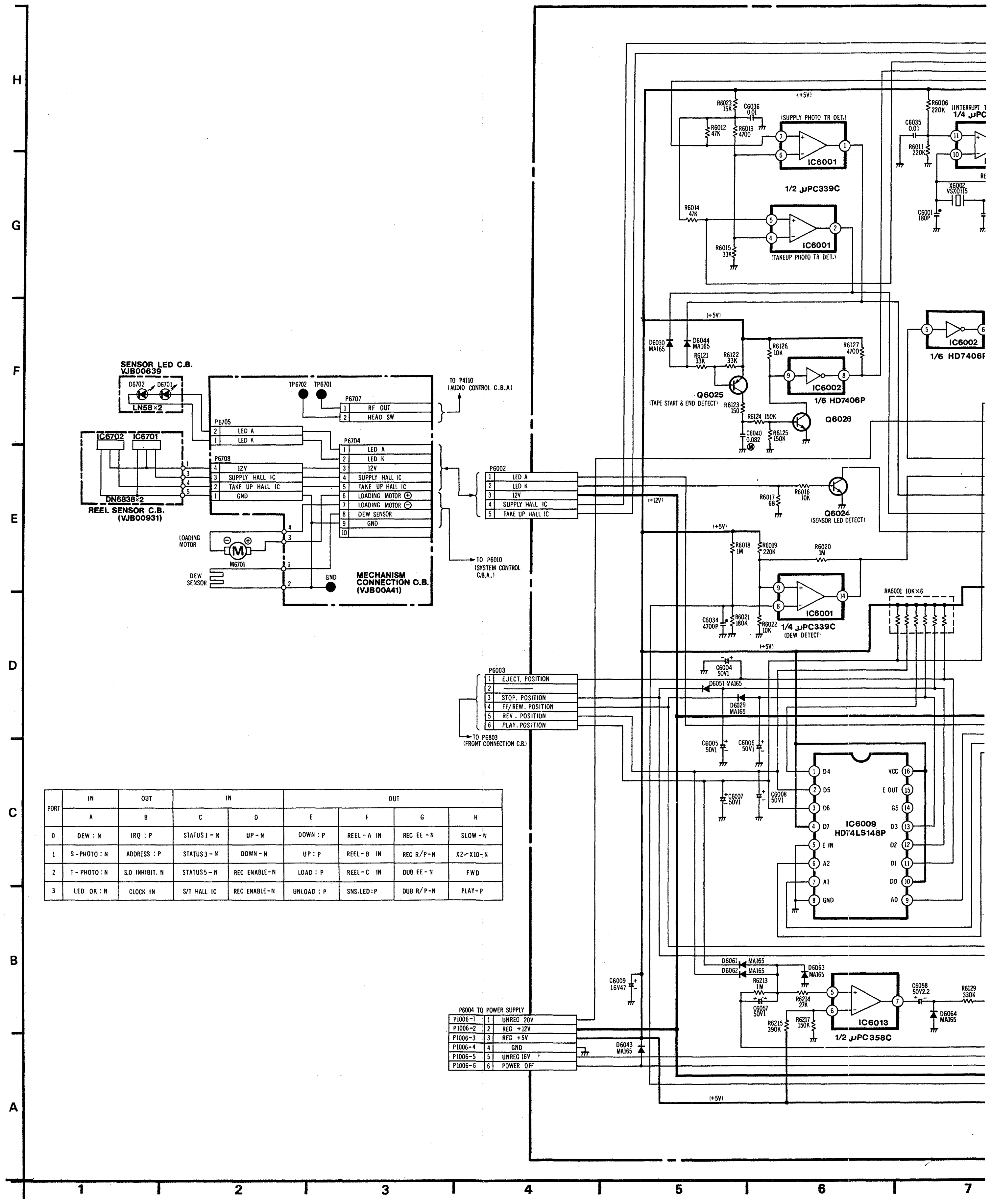
REF. NO.	IC6001																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14						
STOP	4.82	4.82	4.83	3.01	3.43	3.02	3.43	0	0.27	2.05	2.43	0	2.15	4.76						
PLAY	4.88	4.88	4.87	3.05	3.47	3.05	3.46	0	0.26	2.12	2.45	0	2.37	4.84						
REC	4.85	4.88	4.90	3.05	3.47	3.05	3.47	0	0.26	2.13	2.45	0	2.38	4.81						
F.F	4.83	4.70	4.75	3.01	3.42	3.01	3.42	0	0.25	2.06	2.42	0	2.31	4.73						
REW	4.70	4.73	4.81	3.06	0	3.02	3.44	0	0.26	2.12	2.45	0	2.36	4.83						
REF. NO.	IC6002																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14						
STOP	0.07	4.73	0.31	4.41	3.34	0.31	0	0.07	4.75	4.21	0.50	2.46	0.91	4.83						
PLAY	0.05	4.87	0.13	4.47	3.36	0.13	0	0.06	4.82	4.26	−0.37	0.01	0.39	4.90						
REC	0.05	4.77	0.14	4.47	3.39	0.13	0	0.06	4.82	4.26	−0.36	0.01	0.39	4.90						
F.F	0.05	4.74	0.13	4.35	3.27	0.13	0	0.06	4.70	4.21	−0.36	0.01	0.39	4.83						
REW	0.05	4.80	0.13	4.42	3.39	0.13	0	0.06	4.82	4.26	−0.36	0.01	0.39	4.84						
REF. NO.	IC6003																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
STOP	3.62	3.65	0.05	3.63	3.61	3.60	3.51	0.05	4.22	0.69	3.35	4.78	4.83	4.81	4.24	0.07	0.91	0.51	2.17	0.02
PLAY	0.03	3.71	3.71	3.71	3.67	3.65	3.48	3.68	4.26	−0.21	3.36	4.84	4.88	4.88	4.28	0.05	0.39	−0.37	2.38	0
REC	3.68	0.04	0.04	0.04	3.67	3.62	3.50	0.04	4.26	−0.21	3.36	4.84	4.88	4.85	4.28	0.05	0.39	−0.37	—	—
F.F	3.61	3.55	0.04	3.63	3.60	0.04	3.50	0.03	4.20	−0.20	3.40	4.85	4.90	4.90	4.30	0.05	0.39	−0.38	2.38	0
REW	3.69	3.73	3.79	3.68	3.68	0.04	0.02	0.03	4.24	−0.21	3.32	4.68	4.80	4.80	4.23	0.05	0.39	−0.36	2.34	0
REF. NO.	IC6003																			
MODE	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
STOP	0.02	1.78	1.23	4.65	4.06	0.12	4.01	4.86	4.85	0.03	0.01	0.01	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0
PLAY	0	1.78	1.17	4.75	4.12	0.11	0.12	—	4.89	0.02	0	0	0.03	0.03	0.03	0.03	0.03	4.89	0.03	0
REC	0	1.76	1.16	4.74	4.12	0.11	0.12	—	4.88	0.02	0	0	0.03	0.03	0.03	0.03	0.03	4.88	0.03	0
F.F	0	1.77	1.17	4.76	0.11	0.11	4.01	2.50	4.91	0.02	0	0	0.03	0.03	0.03	0.03	0.03	0.03	4.89	0
REW	0	0	1.18	4.74	0.11	0.11	0	0.02	4.90	0.02	0	0	0.03	0.03	0.03	0.03	0.03	0.03	4.89	0
REF. NO.	IC6003																			
MODE	41	42																		
STOP	4.73	4.73																		
PLAY	4.79	4.79																		
REC	4.78	4.78																		
F.F	4.79	4.79																		
REW	4.79	4.76																		
REF. NO.	IC6004										IC6005									
MODE	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
STOP	0	0.54	0.89	0.36	0.03	0.04	7.61	7.61	0.92	0.54	0	0.52	0.88	0.34	0.03	0.03	7.61	7.61	0.91	0.52
PLAY	0	0.53	0.88	0.60	0.03	0.03	7.62	7.62	0.91	0.53	0	0.51	0.87	1.61	0.03	0.03	7.62	7.62	0.90	0.51
REC	0	0.53	0.88	0.53	0.03	0.03	7.62	7.62	0.91	0.53	0	0.57	0.87	0.59	0.03	0.03	7.61	7.61	0.90	0.51
F.F	0	0.54	0.89	0.59	0.03	0.03	7.62	7.61	0.92	0.54	0	0.54	0.87	0.64	0.03	0.03	7.62	7.62	0.90	0.53
REW	0	0.53	0.88	0.42	0.03	0.03	7.62	7.61	0.91	0.53	0	0.53	0.87	0.44	0.03	0.03	7.62	7.62	0.90	0.53
REF. NO.	IC6006																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
STOP	0.01	0.03	0.03	0.03	0.01	0.07	0.03	0.01	0.27	0.01	0	0	0.98	0	0	11.9				
PLAY	0	0.03	4.89	0.03	0.20	0.19	0.25	4.35	4.25	0.28	0.01	0.23	3.66	0	0	11.9				
REC	0.01	0.03	4.88	0.01	0.20	0.21	0.21	4.35	4.22	0.21	0	0.31	3.66	0	0	11.9				
F.F	0.01	4.88	0.03	0.03	0.13	0.12	0	9.51	9.67	0.11	0	0	0	0	0	11.9				
REW	0	4.85	0.03	0.03	0.12	0.71	0	9.56	9.71	0.19	0	0	0.98	0	0	11.9				
REF. NO.	IC6007										IC6008									
MODE	1	2	3	4	5	6	7	8			1	2	3	4	5	6	7	8	9	10
STOP	0.37	0.01	0.01	0	0.01	0.06	0.01	14.7			0	0.61	0.03	0	0.01	0.61	0.01	0.61	0.01	1.10
PLAY	4.92	2.06	2.06	0	0.21	0.20	3.61	14.5			0.20	0.90	0.25	0.19	3.29	2.64	3.29	3.34	0.25	3.35
REC	4.87	2.03	2.04	0	0.22	0.20	3.60	14.5			0.19	0.90	0.25	0.19	3.24	3.59	3.24	3.29	0.26	3.29
F.F	10.4	10.5	9.56	0	0	0.06	13.4	14.5			0.16	0.89	0	0.17	8.87	8.17	8.88	8.91	0.20	8.99
REW	10.4	10.5	9.62	0	0.13	0.06	13.4	14.5			0.18	0.19	9.06	0.94	0.18	8.80	0.18	8.08	8.77	8.80
REF. NO.	IC6009																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
STOP	4.84	4.78	4.47	4.84	0	4.00	0.12	0	4.01	4.85	4.84	0.60	4.84	0.13	4.00	4.84				
PLAY	4.88	4.89	−0.02	4.86	0	0.12	0.11	0	4.11	4.89	4.88	4.89	4.85	0.12	4.09	4.85				
REC	4.89	4.89	−0.01	4.90	0	0.12	0.11	0	4.11	4.90	4.89	4.89	4.89	0.12	4.10	4.90				
F.F	4.86	4.89	4.52	4.89	0	4.10	0.11	0	0.11	4.89	4.85	4.89	0.57	0.12	4.05	4.89				
REW	4.88	4.86	4.51	4.89	0	4.10	0.11	0	0.11	4.89	4.85	4.88	0.58	0.12	4.05	4.89				
REF. NO.	IC6010																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14						
STOP	2.47	4.10	2.41	4.78	2.40	2.42	0	4.03	2.41	2.44	2.41	2.46	2.45	4.85						
PLAY	0.01	—	—	—	—	4.02	0	—	2.41	3.27	0	0.01	0.01	4.86						
REC	0.01	—	3.25	—	3.34	4.04	0	—	−0.01	4.07	2.43	0.01	0.01	4.86						
F.F	0.01	0.08	3.56	2.49	3.56	3.72	0	−0.03	−0.01	3.72	2.43	2.46	—	4.86						
REW	0.01	0.08	3.53	2.48	3.55	3.71	0	−0.03	−0.01	3.71	2.42	2.47	2.47	4.89						
REF. NO.	IC6011																			
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14						
STOP	3.64	0.07	1.78	0.05	1.77	0.05	0	5.62	0.05	0.06	1.77	0.06	1.78	4.83						
PLAY	0.03	4.83	1.77	0.05	1.76	0.05	0	0.14	3.67	0.05	1.77	0.05	1.77	4.88						
REC	3.68	0.06	1.78	0.05	1.77	0.04	0	11.9	0.04	0.05	1.78	0.05	1.78	4.90						
F.F	3.67	0.06	1.77	0.05	1.77	0.05	0	5.63	0.03	0.05	1.78	0.05	1.77	4.89						
REW	3.68	0.06	1.77	0.05	1.76	0.05	0	5.63	0.03	0.05	1.78	0.05	1.77	4.88						

REF. NO.	IC6012														IC6013							
MODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8
STOP	3.61	11.9	3.66	11.7	3.68	11.9	0	0.08	0.07	0.06	0.05	11.9	3.63	4.72	8.85	7.61	7.61	0	0	0	0	14.7
PLAY	3.64	11.9	3.70	11.9	3.71	11.9	0	11.9	4.83	11.9	3.71	0	3.66	4.76	8.85	7.62	7.62	0	0	0	0	14.5
REC	3.65	11.9	0.04	0.05	0.04	0.07	0	0.07	0.06	0.06	0.04	11.9	3.67	4.78	8.85	7.62	7.62	0	0	0	0	14.5
F.F	0.04	11.9	3.67	11.9	3.72	11.9	0	0.07	0.06	0.06	0.04	11.9	3.67	4.77	8.85	7.61	7.61	0	0	0	0	14.5
REW	0.04	11.9	3.71	11.9	3.73	11.9	0	0.07	0.06	0.06	0.04	11.9	3.68	4.74	8.85	7.62	7.62	0	0	0	0	14.5

SYSTEM CONTROL TRANSISTORS DC VOLTAGE CHART

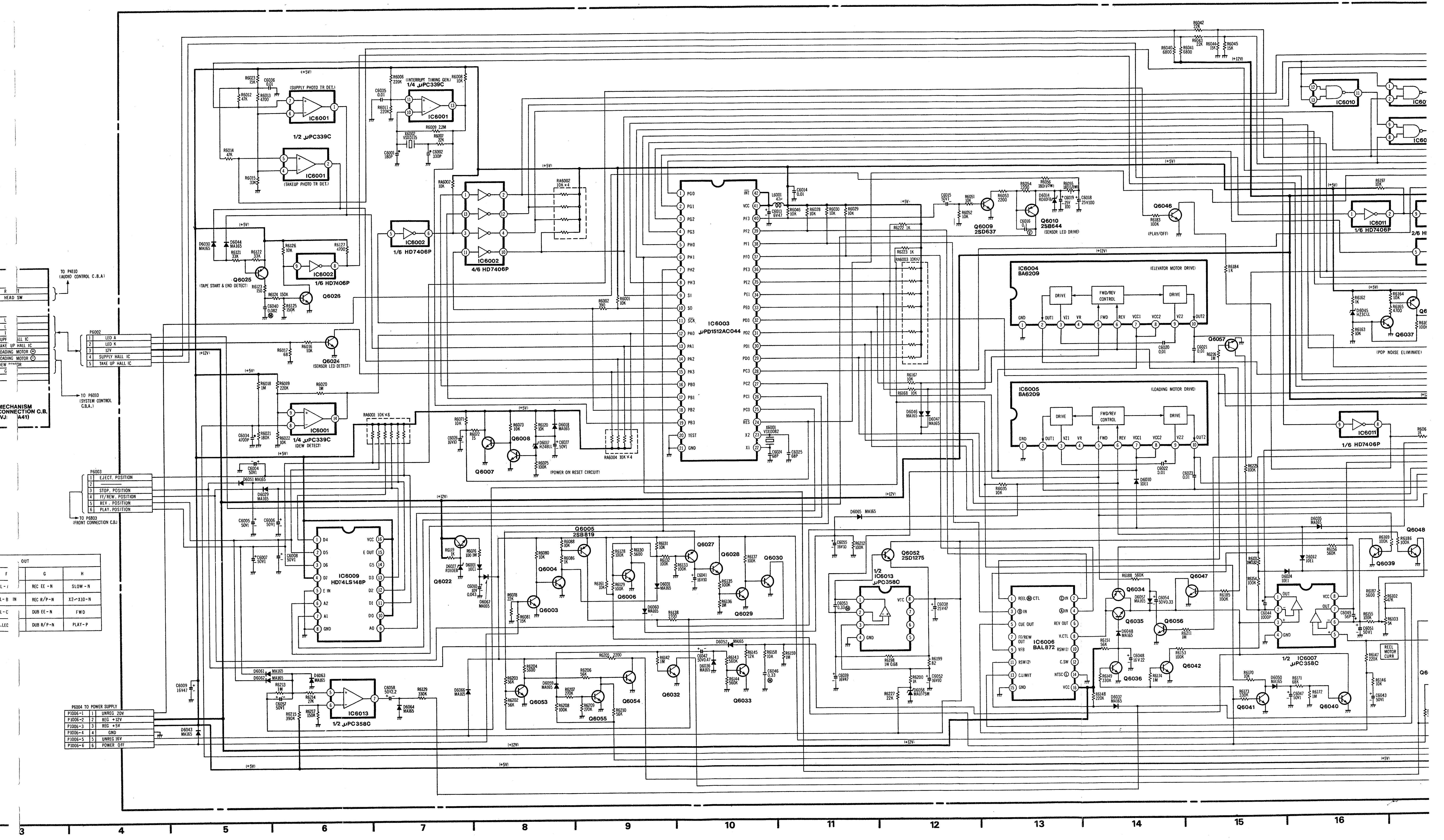
REF. NO.	Q6003			Q6004			Q6005			Q6006			Q6007		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.02	0.64	0	7.25	0.02	7.27	0.58	7.26	0	0.03	0.64	0	4.65	0.03
PLAY	0	0.02	0.64	0	7.28	0.02	7.29	−0.07	7.28	0	0.03	0.63	0	4.70	0.03
REC	0	0.02	0.64	0	7.17	0.02	7.29	−0.07	7.29	0	0.03	0.63	0	4.74	0.03
F.F	0	0.02	0.65	0	7.23	0.02	7.24	0.57	7.23	0	0.06	0.63	0	4.74	0.03
REW	0	0.02	0.65	0	7.27	0.02	7.28	0	7.27	0	0.06	0.63	0	4.75	0.03
REF. NO.	Q6008			Q6009			Q6010			Q6011			Q6012		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.04	0.60	0	9.40	−0.26	10.1	0.21	9.97	0.01	11.9	11.2	11.9	0	11.9
PLAY	0	0.03	0.60	0	9.44	−0.26	10.2	2.22	10.0	11.9	0	11.9	11.9	0	11.9
REC	0	0.03	0.60	0	9.42	−0.27	10.2	0.18	10.0	11.9	11.9	11.3	11.9	11.9	11.2
F.F	0	0.03	0.60	0	9.42	−0.27	10.2	2.02	10.0	11.9	11.9	11.2	11.9	−0.01	11.9
REW	0	0.03	0.60	0	9.44	−0.27	10.2	2.02	10.0	11.9	11.9	11.2	11.9	−0.01	11.9
REF. NO.	Q6013			Q6019			Q6020			Q6021			Q6022		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	11.9	11.8	11.2	0.61	0.61	1.32	0	0.61	0.03	0	0.03	0.67	8.82	11.9	9.47
PLAY	11.9	11.8	11.2	0.90	0.93	1.63	0.20	3.33	0.04	0	0.04	0.68	8.83	11.9	9.48
REC	11.9	0.14	11.9	0.90	0.93	0	0	3.39	0.04	0	0.04	0.67	8.84	11.9	9.50
F.F	11.9	11.8	11.2	0.89	0.96	1.63	0.16	8.86	0.04	0	0.04	0.66	8.83	11.9	9.49
REW	11.9	11.8	11.2	0.18	8.98	0.02	—	0.97	1.66	0	1.65	0.06	8.84	11.9	9.49
REF. NO.	Q6024			Q6025			Q6026			Q6027			Q6028		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	4.23	0.09	4.81	0	0.01	0	4.75	0	3.45	2.80	3.16	2.37	7.27	2.80
PLAY	0	4.27	0.09	4.88	0	4.86	0	4.78	0	3.50	2.84	3.17	2.39	7.30	2.84
REC	0	4.25	0.08	4.88	0	4.87	0	4.82	0	3.48	2.82	3.17	2.39	7.30	2.84
F.F	0	4.28	0.08	4.82	0	4.82	0	4.81	0	3.47	2.82	3.15	2.39	7.25	2.81
REW	0	4.27	0.08	4.87	0	4.86	0	4.82	0	0.02	0.02	0.60	0	7.28	0.02
REF. NO.	Q6029			Q6030			Q6032			Q6033			Q6034		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.02	0.57	0	0.58	0	0	0.01	0.05	0	0.05	0	0	0.05	0
PLAY	0	0.02	0.57	0	−0.06	0.22	0	0.19	0.05	0	2.08	0	4.34	2.08	4.55
REC	0	0.02	0.57	0	−0.06	0.02	0	0.19	0.05	0	2.08	0	4.34	2.10	4.56
F.F	0	0.02	0.58	0	0.58	0.02	0	0.16	0.05	0	9.53	0	9.54	9.53	12.7
REW	0	0.60	0	0	0	0.60	0	0.01	0.51	0	9.59	0.01	9.54	9.56	12.7
REF. NO.	Q6035			Q6036			Q6037			Q6038			Q6039		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0.05	0	0.11	0	0.04	0.58	0	0.01	0.73	4.76	4.67	3.98	0	0.06	0.03
PLAY	2.09	4.34	0.94	0	0.04	0.58	0	0.01	0.74	4.88	4.75	4.08	0	0.21	0.03
REC	2.10	4.34	0.22	0	0.04	0.57	0	0.01	0.74	4.88	4.73	4.11	0	0.20	0.03
F.F	9.54	9.54	10.1	0	10.5	−0.02	0	0.01	0.74	4.88	4.76	4.10	0	0.06	0.03
REW	9.52	9.52	10.1	0	10.7	−0.02	0	0.01	0.74	4.84	4.76	4.10	0	0.06	0.03
REF. NO.	Q6040			Q6041			Q6042			Q6044			Q6045		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.05	0	0	0	0.55	0	0.01	0.50	0	0.20	0.50	0	0.01	0.02
PLAY	0	2.09	0	0	0	0.55	0	0.03	0.51	0	0.02	0.50	0	0.20	0.02
REC	0	2.09	0	0	0	0.55	0	0.03	0.51	0	0.02	0.50	0	0.19	0.02
F.F	0	9.69	0	0	0.03	−0.02	0	10.6	0	0	0.02	0.49	0	0.17	0.02
REW	0	9.51	0	0	0.03	0	0	10.5	0	0	0.02	0.49	0	0.14	0.02
REF. NO.	Q6046			Q6047			Q6048			Q6051			Q6052		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.12	0.65	0	0	0.03	0	0.05	0.03	0	0.02	0.56	7.63	14.7	8.85
PLAY	0	0.14	−0.02	0	2.11	0.03	0	0.20	0.03	0	0.02	0.56	7.63	14.5	8.84
REC	0	11.9	−0.02	0	2.10	0.03	0	0.20	0.03	0	0.02	0.56	7.63	14.5	8.84
F.F	0	0.11	0.65	0	9.53	0.03	0	0.05	0.03	0	0.48	−0.01	7.62	14.6	8.84
REW	0	0.11	0.65	0	9.62	0.03	0	0.05	0.03	0	0.55	−0.02	7.63	14.6	8.84
REF. NO.	Q6053			Q6054			Q6055			Q6056			Q6057		
MODE	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.63	3.38	0	3.04	0.04	0	0.04	0.01	0	—	0.03	0	0.07	−0.18
PLAY	0	0.05	0.63	0	3.24	0.04	0	0.04	0.01	0	—	0.49	0.01	1.79	0.02
REC	0	0.05	0.63	0	3.23	0.04	0	0.03	0.04	0	—	0.04	0	1.77	0
F.F	0	0.05	0.62	0	3.22	0.26	0	0.21	0.14	0	—	0.04	0.01	10.3	0.01
REW	0	6.64	0.02	0	0.06	0.66	0	0.66	0.23	0	—	0.03	0.01	10.3	0.02

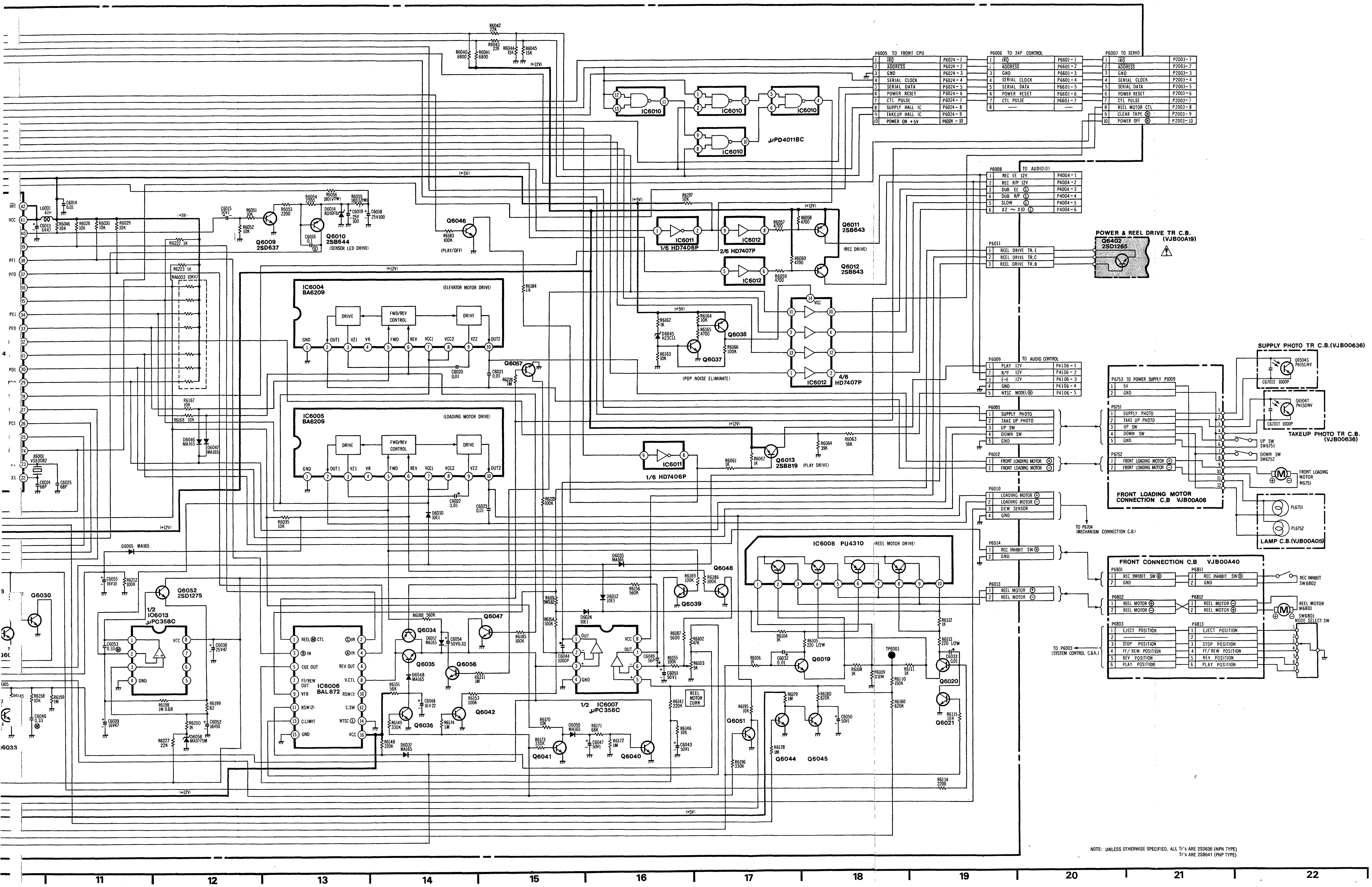
SYSTEM CONTROL SCHEMATIC DIAGRAM


H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
SENSOR LED C.B.
VJB00639
D6702
D6701
LN58×2
IC6702
IC6701
DN6838×2
REEL SENSOR C.B.
(VJB00931)
TP6702
TP6701
P6707
1 RF OUT
2 HEAD SW
TO P4110
(AUDIO CONTROL C.B.A)
P6705
2 LED A
1 LED K
P6708
4 12V
3 SUPPLY HALL IC
2 TAKE UP HALL IC
1 GND
P6704
1 LED A
2 LED K
3 12V
4 SUPPLY HALL IC
5 TAKE UP HALL IC
6 LOADING MOTOR ⊕
7 LOADING MOTOR ⊖
8 DEW SENSOR
9 GND
10
LOADING MOTOR
M6701
DEW SENSOR
GND
MECHANISM CONNECTION C.B.
(VJB00A41)
TO P6010
(SYSTEM CONTROL C.B.A.)
P6002
1 LED A
2 LED K
3 12V
4 SUPPLY HALL IC
5 TAKE UP HALL IC
P6003
1 EJECT. POSITION
2
3 STOP. POSITION
4 FF/REW. POSITION
5 REV. POSITION
6 PLAY. POSITION
TO P6803
(FRONT CONNECTION C.B.)
P6004 TO POWER SUPPLY
P1006-1 1 UNREG 20V
P1006-2 2 REG +12V
P1006-3 3 REG +5V
P1006-4 4 GND
P1006-5 5 UNREG 16V
P1006-6 6 POWER OFF
(+5V)
(+12V)
R6023 15K
C6036 0.01
R6012 47K
R6013 4700
(SUPPLY PHOTO TR DET.)
IC6001
1/2 μPC339C
R6014 47K
R6015 33K
(TAKEUP PHOTO TR DET.)
R6006 220K
(INTERRUPT
1/4 μPC
C6035 0.01
R6011 220K
X6002 VSX0115
C6001 180P
IC6002
1/6 HD7406P
D6030 MA165
D6044 MA165
R6121 33K
R6122 33K
R6126 10K
R6127 4700
Q6025
(TAPE START & END DETECT)
R6123 150
R6124 150K
R6125 150K
C6040 0.082
Q6026
R6017 68
R6016 10K
Q6024
(SENSOR LED DETECT)
R6018 1M
R6019 220K
R6020 1M
C6034 4700P
R6021 180K
R6022 10K
1/4 μPC339C
(DEW DETECT)
RA6001 10K×6
C6004 50V1
D6051 MA165
D6029 MA165
C6005 50V1
C6006 50V1
C6007 50V1
C6008 50V1
IC6009
HD74LS148P
D4
D5
D6
D7
E IN
A2
A1
GND
VCC
E OUT
GS
D3
D2
D1
D0
A0
C6009 16V47
D6061 MA165
D6062 MA165
D6063 MA165
R6213 1M
C6057 50V1
R6214 27K
R6215 390K
R6217 150K
IC6013
1/2 μPC358C
C6058 50V2.2
D6064 MA165
R6129 330K
D6043 MA165

PORT	IN	OUT	IN		OUT			
	A	B	C	D	E	F	G	H
0	DEW : N	IRQ : P	STATUS1 – N	UP – N	DOWN : P	REEL – A IN	REC EE – N	SLOW – N
1	S – PHOTO : N	ADDRESS : P	STATUS3 – N	DOWN – N	UP : P	REEL – B IN	REC R/P – N	X2∽X10 – N
2	T – PHOTO : N	S.O INHIBIT. N	STATUS5 – N	REC ENABLE – N	LOAD : P	REEL – C IN	DUB EE – N	FWD
3	LED OK : N	CLOCK IN	S/T HALL IC	REC ENABLE – N	UNLOAD : P	SNS.LED : P	DUB R/P – N	PLAY – P

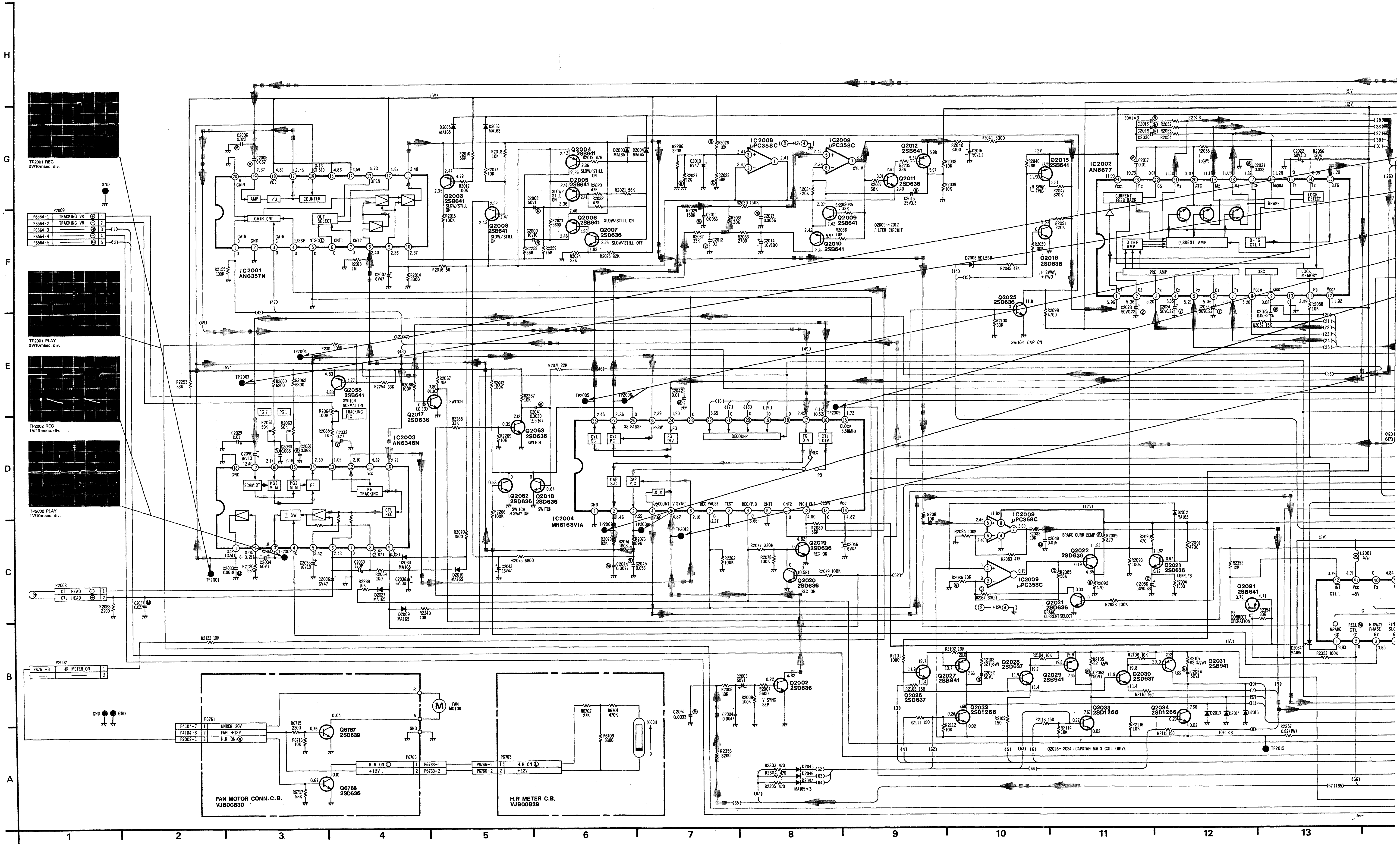
HEMATIC DIAGRAM

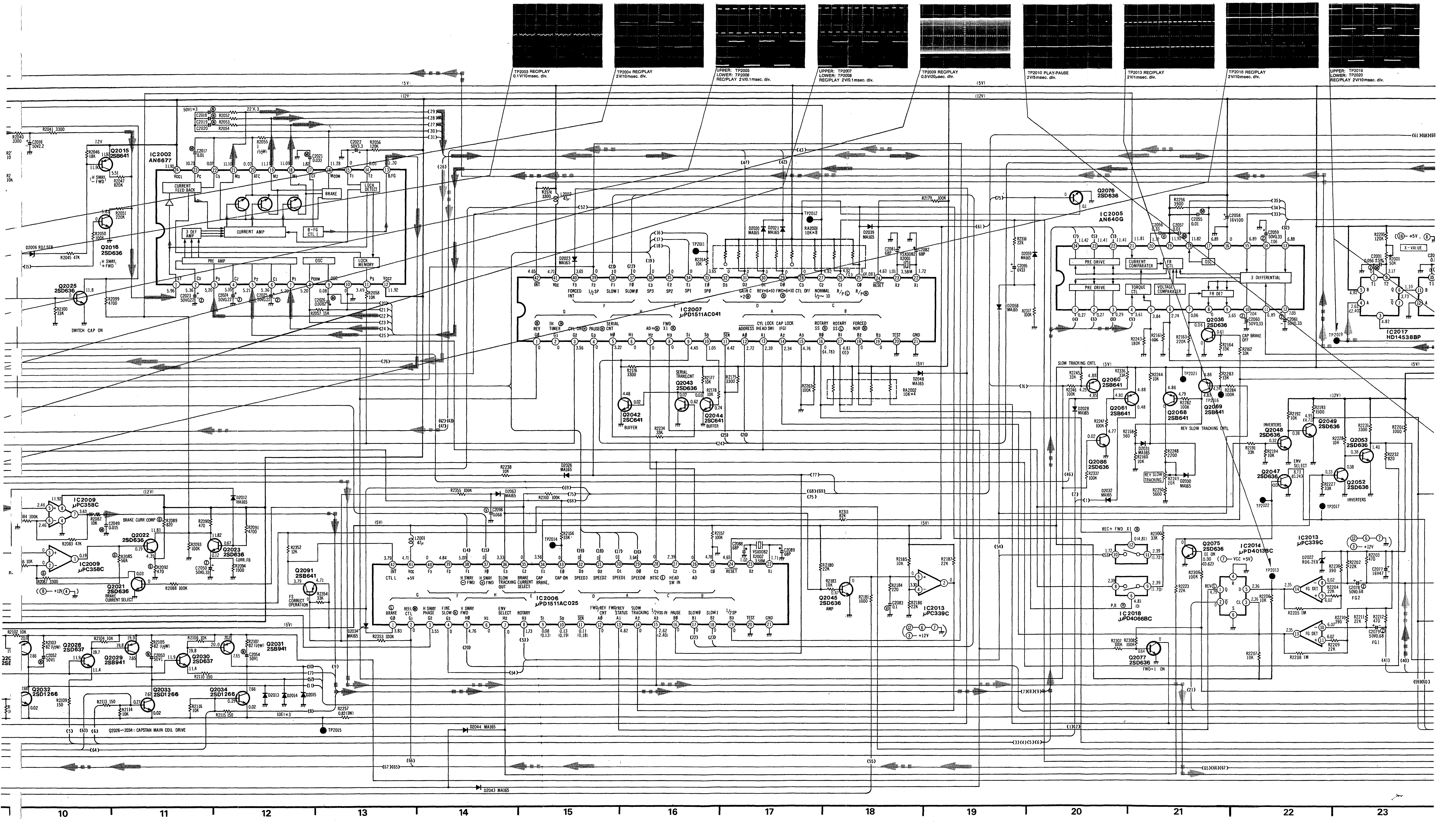

IC6001 1/2 μPC339C (SUPPLY PHOTO TR DET.)
IC6001 (TAKEUP PHOTO TR DET.)
1/4 μPC339C (INTERRUPT TIMING GEN.)
IC6001 1/4 μPC339C (DEW DETECT)
IC6002 1/6 HD7406P
IC6002 4/6 HD7406P
RA6002 10K×4
RA6001 10K×6
RA6004 10K×4
RA6003 10K×7
IC6003 μPD1512AC044
X6001 VSX0082
X6002 VSX0115
Q6025 (TAPE START & END DETECT)
Q6026
Q6024 (SENSOR LED DETECT)
Q6007
Q6008 (POWER ON RESET CIRCUIT)
Q6009 2SD637
Q6010 2SB644 (SENSOR LED DRIVE)
Q6046 (PLAY/OFF)
IC6004 BA6209 (ELEVATOR MOTOR DRIVE)
IC6005 BA6209 (LOADING MOTOR DRIVE)
DRIVE
FWD/REV CONTROL
GND OUT1 VZ1 VR FWD REV VCC1 VCC2 VZ2 OUT2
IC6010
IC6011 1/6 HD7406P
2/6 H
Q6037 (POP NOISE ELIMINATE)
Q6057
TO P4110 (AUDIO CONTROL C.B.A)
P6002
1 LED A
2 LED K
3 12V
4 SUPPLY HALL IC
5 TAKE UP HALL IC
TO P6010 (SYSTEM CONTROL C.B.A.)
MECHANISM CONNECTION C.B. (VJ A41)
HEAD SW
LOADING MOTOR ⊕
LOADING MOTOR ⊖
P6003
1 EJECT. POSITION
2 ———
3 STOP. POSITION
4 FF/REW. POSITION
5 REV. POSITION
6 PLAY. POSITION
TO P6803 (FRONT CONNECTION C.B.)
IC6009 HD74LS148P
D4 D5 D6 D7 E IN A2 A1 GND VCC E OUT GS D3 D2 D1 D0 A0
IC6013 1/2 μPC358C
Q6022
Q6005 2SB819
Q6003 Q6004 Q6006 Q6027 Q6028 Q6029 Q6030
Q6053 Q6054 Q6055 Q6032 Q6033
Q6052 2SD1275
1/2 IC6013 μPC358C
IC6006 BAL872
REEL CTL, IN, IN, CUE OUT, REV OUT, FF/REW OUT, V.CTL, VFB, RSW(1), RSW(2), C.SW, C.LIMIT, NTSC, GND, VCC
Q6034 Q6035 Q6036 Q6042 Q6047 Q6056
1/2 IC6007 μPC358C
Q6039 Q6040 Q6041 Q6048
REEL MOTOR CURR
P6004 TO POWER SUPPLY
P1006-1 1 UNREG 20V
P1006-2 2 REG +12V
P1006-3 3 REG +5V
P1006-4 4 GND
P1006-5 5 UNREG 16V
P1006-6 6 POWER OFF
OUT
F G H
REC EE-N SLOW-N
REC R/P-N X2~X10-N
DUB EE-N FWD
DUB R/P-N PLAY-P
(+5V)
(+12V)
3 4 5 6 7 8 9 10 11 12 13 14 15 16

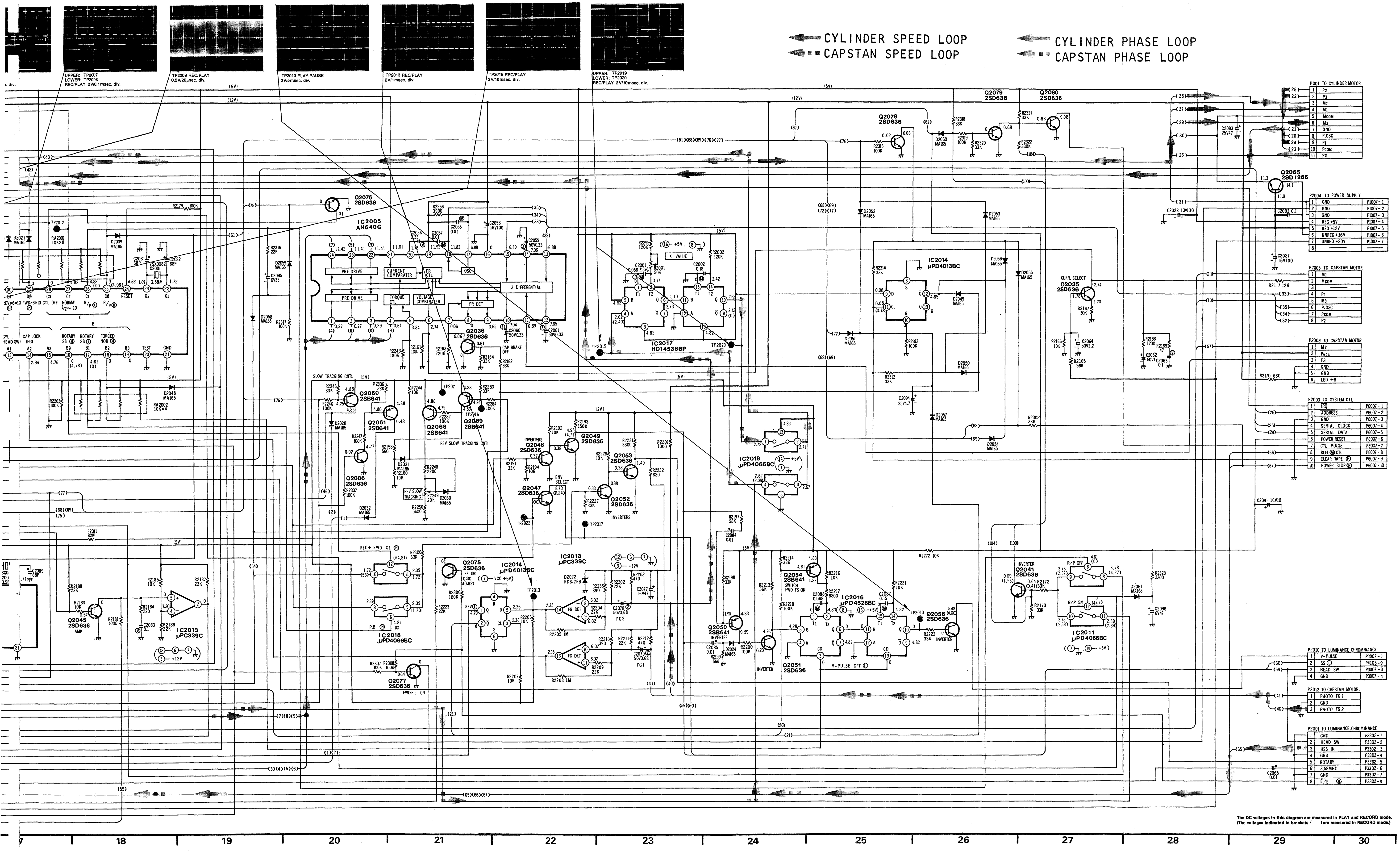

P6005 TO FRONT CPU
1 IRQ P6024-1
2 ADDRESS P6024-2
3 GND P6024-3
4 SERIAL CLOCK P6024-4
5 SERIAL DATA P6024-5
6 POWER RESET P6024-6
7 CTL PULSE P6024-7
8 SUPPLY HALL IC P6024-8
9 TAKEUP HALL IC P6024-9
10 POWER ON +5V P6024-10
P6006 TO 34P CONTROL
1 IRQ P6601-1
2 ADDRESS P6601-2
3 GND P6601-3
4 SERIAL CLOCK P6601-4
5 SERIAL DATA P6601-5
6 POWER RESET P6601-6
7 CTL PULSE P6601-7
8 — —
P6007 TO SERVO
1 IRQ P2003-1
2 ADDRESS P2003-2
3 GND P2003-3
4 SERIAL CLOCK P2003-4
5 SERIAL DATA P2003-5
6 POWER RESET P2003-6
7 CTL PULSE P2003-7
8 REEL MOTOR CTL P2003-8
9 CLEAR TAPE Ⓗ P2003-9
10 POWER OFF Ⓗ P2003-10
IC6010
μPD4011BC
P6008 TO AUDIO(1)
1 REC EE 12V P4004-1
2 REC R/P 12V P4004-2
3 DUB EE Ⓛ P4004-3
4 DUB R/P Ⓛ P4004-4
5 SLOW Ⓛ P4004-5
6 X2 ~ X10 Ⓛ P4004-6
P6011
1 REEL DRIVE TR.E
2 REEL DRIVE TR.C
3 REEL DRIVE TR.B
POWER & REEL DRIVE TR C.B. (VJB00A19)
Q6402 2SD1265
P6009 TO AUDIO CONTROL
1 PLAY 12V P4106-1
2 R/P 12V P4106-2
3 E-E 12V P4106-3
4 GND P4106-4
5 NTSC MODEL Ⓗ P4106-5
P6001
1 SUPPLY PHOTO
2 TAKE UP PHOTO
3 UP SW
4 DOWN SW
5 GND
P6012
1 FRONT LOADING MOTOR ⊕
2 FRONT LOADING MOTOR ⊖
P6010
1 LOADING MOTOR ⊕
2 LOADING MOTOR ⊖
3 DEW SENSOR
4 GND
TO P6704 (MECHANISM CONNECTION C.B.)
P6014
1 REC INHIBIT SW Ⓗ
2 GND
P6013
1 REEL MOTOR ⊕
2 REEL MOTOR ⊖
P6753 TO POWER SUPPLY P1009
1 5V
2 GND
P6751
1 SUPPLY PHOTO
2 TAKE UP PHOTO
3 UP SW
4 DOWN SW
5 GND
P6752
1 FRONT LOADING MOTOR ⊕
2 FRONT LOADING MOTOR ⊖
FRONT LOADING MOTOR CONNECTION C.B VJB00A06
SUPPLY PHOTO TR C.B.(VJB00636)
Q6504S PN150NV
C6701S 1000P
Q6504T PN150NV
C6701T 1000P
TAKEUP PHOTO TR C.B. (VJB00636)
UP SW SW6751
DOWN SW SW6752
FRONT LOADING MOTOR M6751
PL6751
PL6752
LAMP C.B.(VJB00A05)
FRONT CONNECTION C.B VJB00A40
P6801
1 REC INHIBIT SW Ⓗ
2 GND
P6811
1 REC INHIBIT SW Ⓗ
2 GND
REC INHIBIT SW6802
P6802
1 REEL MOTOR ⊕
2 REEL MOTOR ⊖
P6812
1 REEL MOTOR ⊖
2 REEL MOTOR ⊕
REEL MOTOR M6801
SW6801 MODE SELECT SW
P6803
1 EJECT POSITION
2 —
3 STOP POSITION
4 FF/REW POSITION
5 REV POSITION
6 PLAY POSITION
P6813
1 EJECT POSITION
2 —
3 STOP POSITION
4 FF/REW POSITION
5 REV POSITION
6 PLAY POSITION
TO P6003 (SYSTEM CONTROL C.B.A.)
IC6011 1/6 HD7406P
IC6012 2/6 HD7407P
IC6012 4/6 HD7407P
Q6011 2SB643
Q6012 2SB643
(REC DRIVE)
Q6038
Q6037
(POP NOISE ELIMINATE)
IC6011 1/6 HD7406P
Q6013 2SB819 (PLAY DRIVE)
Q6046 (PLAY/OFF)
Q6009 2SD637
Q6010 2SB644 (SENSOR LED DRIVE)
IC6004 BA6209 (ELEVATOR MOTOR DRIVE)
IC6005 BA6209 (LOADING MOTOR DRIVE)
DRIVE
FWD/REV CONTROL
GND OUT1 VZ1 VR FWD REV VCC1 VCC2 VZ2 OUT2
Q6057
IC6008 PU4310 (REEL MOTOR DRIVE)
Q6048
Q6039
Q6030
Q6052 2SD1275
1/2 IC6013 μPC358C
IC6006 BAL872
REEL Ⓜ CTL
Ⓑ IN
CUE OUT
FF/REW OUT
VFB
RSW(2)
C.LIMIT
GND
Ⓒ IN
Ⓐ IN
REV OUT
V.CTL
RSW(1)
C.SW
NTSC Ⓛ
VCC
Q6034
Q6035
Q6036
Q6047
Q6056
Q6042
1/2 IC6007 μPC358C
REEL MOTOR CURR
Q6041
Q6040
Q6019
Q6020
Q6021
Q6051
Q6044
Q6045
TP6001
X6001 VSX0082
INT VCC PF1 PF0 PE1 PE0 PD1 PC1 X1
11 12 13 14 15 16 17 18 19 20 21 22

NOTE: UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE)
Tr's ARE 2SB641 (PNP TYPE)

SERVO SCHEMATIC DIAGRAM

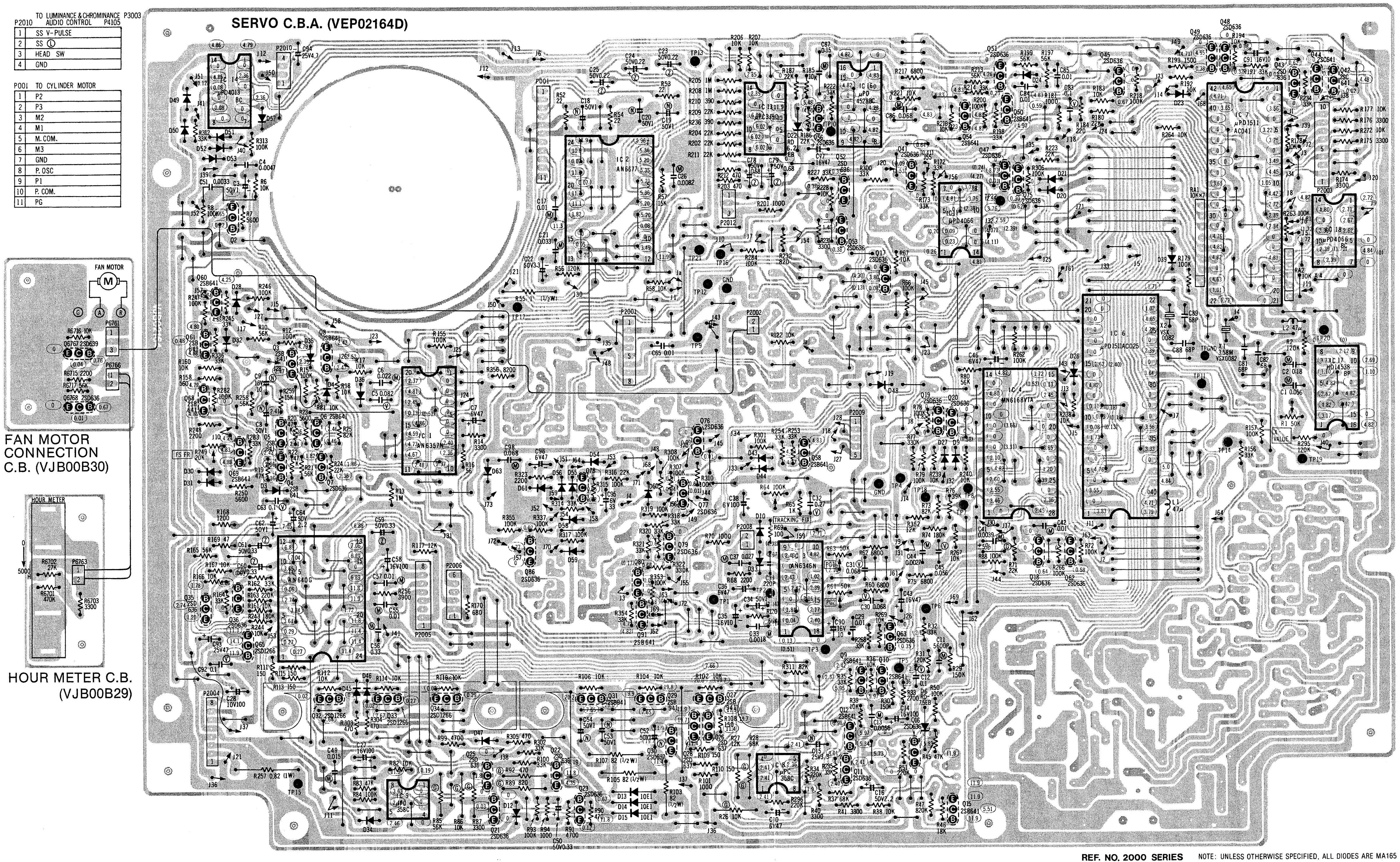

H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
TP2001 REC
2V/10msec. div.
TP2001 PLAY
2V/10msec. div.
TP2002 REC
1V/10msec. div.
TP2002 PLAY
1V/10msec. div.
GND
P2009
P6564-1 TRACKING VR
P6564-2 TRACKING VR
P6564-3
P6564-4
P6564-5
IC2001
AN6357N
GAIN CNT
AMP
COUNTER
OUT SELECT
IC2003
AN6346N
SCHMIDT
PG1 M.M
PG2 M.M
FF
PB TRACKING
CTL REC
SW
Q2058
2SB641
SWITCH NORMAL ON
TRACKING FIX
Q2017
2SD636
SWITCH
Q2003
2SB641
SLOW/STILL ON
Q2008
2SB641
SLOW/STILL ON
Q2004
2SB641
SLOW/STILL ON
Q2005
2SB641
Q2006
2SB641
SLOW/STILL ON
Q2007
2SD636
SLOW/STILL OFF
IC2008
µPC358C
CYL V
Q2012
2SB641
Q2011
2SD636
Q2009
2SB641
Q2010
2SB641
Q2009～2012
FILTER CIRCUIT
Q2015
2SB641
H SWAY - FWD
Q2016
2SD636
H SWAY + FWD
Q2025
2SD636
SWITCH CAP ON
IC2002
AN6677
CURRENT FEED BACK
BRAKE
LOCK DETECT
3 DEF AMP
CURRENT AMP
B-FG CTL 1
PRE AMP
OSC
LOCK MEMORY
Q2063
2SD636
SWITCH
Q2062
2SD636
SWITCH H SWAY ON
Q2018
2SD636
SWITCH
IC2004
MN6168VIA
CYL SC
CYL PC
SS PAUSE
H-SW
FG DIV
DECODER
CTL DIV
CLOCK 3.58MHz
CAP S.C
CAP P.C
M.M
REC
PB
GND
1/2 COUNT
V.SYNC
REC PAUSE
TEST
REC/P.B
CNT1
CNT2
PICH CNT
SLOW
Vcc
Q2019
2SD636
REC ON
Q2020
2SD636
REC ON
IC2009
µPC358C
BRAKE CURR COMP
Q2022
2SD636
Q2023
2SD636
CURR.FB
Q2021
2SD636
BRAKE CURRENT SELECT
Q2091
2SB641
FS CORRECT OPERATION
P2008
CTL HEAD
P2002
P6761-3 HR METER ON
Q2002
2SD636
V SYNC SEP
Q2027
2SB941
Q2026
2SD637
Q2028
2SD637
Q2029
2SB941
Q2030
2SD637
Q2031
2SB941
Q2032
2SD1266
Q2033
2SD1266
Q2034
2SD1266
Q2026～2034 : CAPSTAN MAIN COIL DRIVE
TP2015
P6761
P4104-7 UNREG 20V
P4104-8 FAN +12V
P2002-1 H.R ON
Q6767
2SD639
Q6768
2SD636
FAN MOTOR
P6766
H.R ON
+12V
P6763-1
P6763-2
P6765-1
P6765-2
P6763
FAN MOTOR CONN. C.B.
VJB00B30
H.R METER C.B.
VJB00B29
5000H
(5V)
(12V)
BRAKE G8
CTL G1
REEL H SWAY PHASE G2
INT
Vcc +5V
CTL L
L2001 47µ


TP2003 REC/PLAY 0.1V/10msec. div.
TP2004 REC/PLAY 2V/10msec. div.
UPPER: TP2005 LOWER: TP2006 REC/PLAY 2V/0.1msec. div.
UPPER: TP2007 LOWER: TP2008 REC/PLAY 2V/0.1msec. div.
TP2009 REC/PLAY 0.5V/20μsec. div.
TP2010 PLAY-PAUSE 2V/5msec. div.
TP2013 REC/PLAY 2V/1msec. div.
TP2018 REC/PLAY 2V/10msec. div.
UPPER: TP2019 LOWER: TP2020 REC/PLAY 2V/10msec. div.
IC2002 AN6677
CURRENT FEED BACK
CURRENT AMP
BRAKE
LOCK DETECT
B-FG CTL I
3 DEF AMP
PRE AMP
OSC
LOCK MEMORY
Q2015 2SB641
Q2016 2SD636
Q2025 2SD636
SWITCH CAP ON
IC2007 μPD1511AC041
IC2006 μPD1511AC025
IC2005 AN640G
PRE DRIVE
CURRENT COMPARATER
FR CTL
3 DIFFERENTIAL
TORQUE CTL
VOLTAGE COMPARATER
FR DET
IC2017 HD14538BP
Q2076 2SD636
Q2036 2SD636
CAP BRAKE OFF
SLOW TRACKING CNTL
REV SLOW TRACKING CNTL
Q2060 2SB641
Q2061 2SB641
Q2068 2SB641
Q2069 2SB641
Q2086 2SD636
Q2042 2SC641 BUFFER
Q2043 2SD636
Q2044 2SC641 BUFFER
IC2009 μPC358C
BRAKE CURR COMP
Q2022 2SD636
Q2023 2SD636 CURR. FB
Q2021 2SD636 BRAKE CURRENT SELECT
Q2091 2SB641
FS CORRECT OPERATION
Q2026 2SD637
Q2029 2SB941
Q2030 2SD637
Q2031 2SB941
Q2032 2SD1266
Q2033 2SD1266
Q2034 2SD1266
Q2026~2034 : CAPSTAN MAIN COIL DRIVE
TP2015
Q2045 2SD636 AMP
IC2013 μPC339C
IC2018 μPD4066BC
REC+ FWD X1
Q2077 2SD636 FWD×1 ON
Q2075 2SD636 EE ON
IC2014 μPD4013BC
Q2048 2SD636 INVERTERS
Q2049 2SD636
Q2047 2SD636 ENV SELECT
Q2053 2SD636
Q2052 2SD636 INVERTERS
IC2013 μPC339C
FG DET
FG2
FG1
TP2011
TP2012
TP2014
TP2017
TP2021
TP2022
(5V)
(12V)
10
11
12
13
14
15
16
17
18
19
20
21
22
23


CYLINDER SPEED LOOP
CAPSTAN SPEED LOOP
CYLINDER PHASE LOOP
CAPSTAN PHASE LOOP
UPPER: TP2007 LOWER: TP2008 REC/PLAY 2V/0.1msec. div.
TP2009 REC/PLAY 0.5V/20μsec. div.
TP2010 PLAY-PAUSE 2V/5msec. div.
TP2013 REC/PLAY 2V/1msec. div.
TP2018 REC/PLAY 2V/10msec. div.
UPPER: TP2019 LOWER: TP2020 REC/PLAY 2V/10msec. div.
IC2005 AN640G
PRE DRIVE
CURRENT COMPARATOR
FR CTL
OSC
3 DIFFERENTIAL
TORQUE CTL
VOLTAGE COMPARATOR
FR DET
IC2017 HD14538BP
X-VALUE
IC2014 μPD4013BC
IC2018 μPD4066BC
IC2013 μPC339C
IC2016 μPD4528BC
IC2011 μPD4066BC
Q2076 2SD636
Q2036 2SD636
Q2060 2SB641
Q2061 2SB641
Q2068 2SB641
Q2069 2SB641
Q2086 2SD636
Q2048 2SD636
Q2049 2SD636
Q2053 2SD636
Q2052 2SD636
Q2047 2SD636
Q2045 2SD636 AMP
Q2075 2SD636
Q2077 2SD636
Q2050 2SB641
Q2051 2SD636
Q2054 2SB641
Q2056 2SD636
Q2078 2SD636
Q2079 2SD636
Q2080 2SD636
Q2065 2SD1266
Q2035 2SD636
Q2041 2SD636
SLOW TRACKING CNTL
REV SLOW TRACKING CNTL
ENV SELECT
INVERTERS
CAP BRAKE OFF
FG DET
FG2
FG1
V-PULSE OFF
INVERTER
CURR. SELECT
R/P OFF
R/P ON
REC+ FWD X1
FWD=1 ON
EE ON
P001 TO CYLINDER MOTOR
P2004 TO POWER SUPPLY
P2005 TO CAPSTAN MOTOR
P2006 TO CAPSTAN MOTOR
P2003 TO SYSTEM CTL
P2010 TO LUMINANCE, CHROMINANCE
P2012 TO CAPSTAN MOTOR
P2001 TO LUMINANCE, CHROMINANCE
17
18
19
20
21
22
23
24
25
26
27
28
29
30

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets (   ) are measured in RECORD mode.)

SERVO C.B.A. (VEP02164D) & SMALL BOARDS.


SERVO C.B.A. (VEP02164D)
FAN MOTOR
IC 2 AN6677
IC 6 μPD1511ACO25
IC 7 μPD1511 AC041
AN6357N
AN6345N
AN6168VTA
TRACKING FIX
HOUR METER

FAN MOTOR CONNECTION C.B. (VJB00B30)

HOUR METER C.B. (VJB00B29)

P2010 TO LUMINANCE & CHROMINANCE P3003 AUDIO CONTROL P4105

1	SS V-PULSE
2	SS Ⓛ
3	HEAD SW
4	GND

P001 TO CYLINDER MOTOR

1	P2
2	P3
3	M2
4	M1
5	M. COM.
6	M3
7	GND
8	P. OSC
9	P1
10	P. COM.
11	PG

P2003 TO SYSTEM CONTROL P6007

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	GND
4	SERIAL CLOCK
5	SERIAL DATA
6	POWER RESET
7	CTL. PULSE
8	REEL MOTOR CTL
9	CLEAR TAPE Ⓗ
10	POWER STOP Ⓗ

REF. NO. 2000 SERIES

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

P2004 TO POWER SUPPLY P1007

1	GND
2	GND
3	GND
4	REG. + 5V
5	REG. +12V
6	UNREG. +16V
7	UNREG. +20V
8	————

P2005 TO CAPSTAN MOTOR

1	M1
2	M. COM.
3	————
4	P1
5	M3
6	P. OSC
7	P. COM.
8	P2

P2006 TO CAPSTAN MOTOR

1	M2
2	P. VOC.
3	P3
4	GND
5	GND
6	LED +B

P2001 TO LUMINANCE & CHROMINANCE P3302

1	GND
2	HEAD SW
3	HSS IN
4	GND
5	ROTARY
6	3.58MHz
7	GND
8	E—E Ⓗ

P2012 TO CAPSTAN MOTOR

1	PHOTO FG1
2	GND
3	PHOTO FG2

P2010 TO FAN MOTOR CONN. P6761

1	HOUR METER ON Ⓛ
2	————

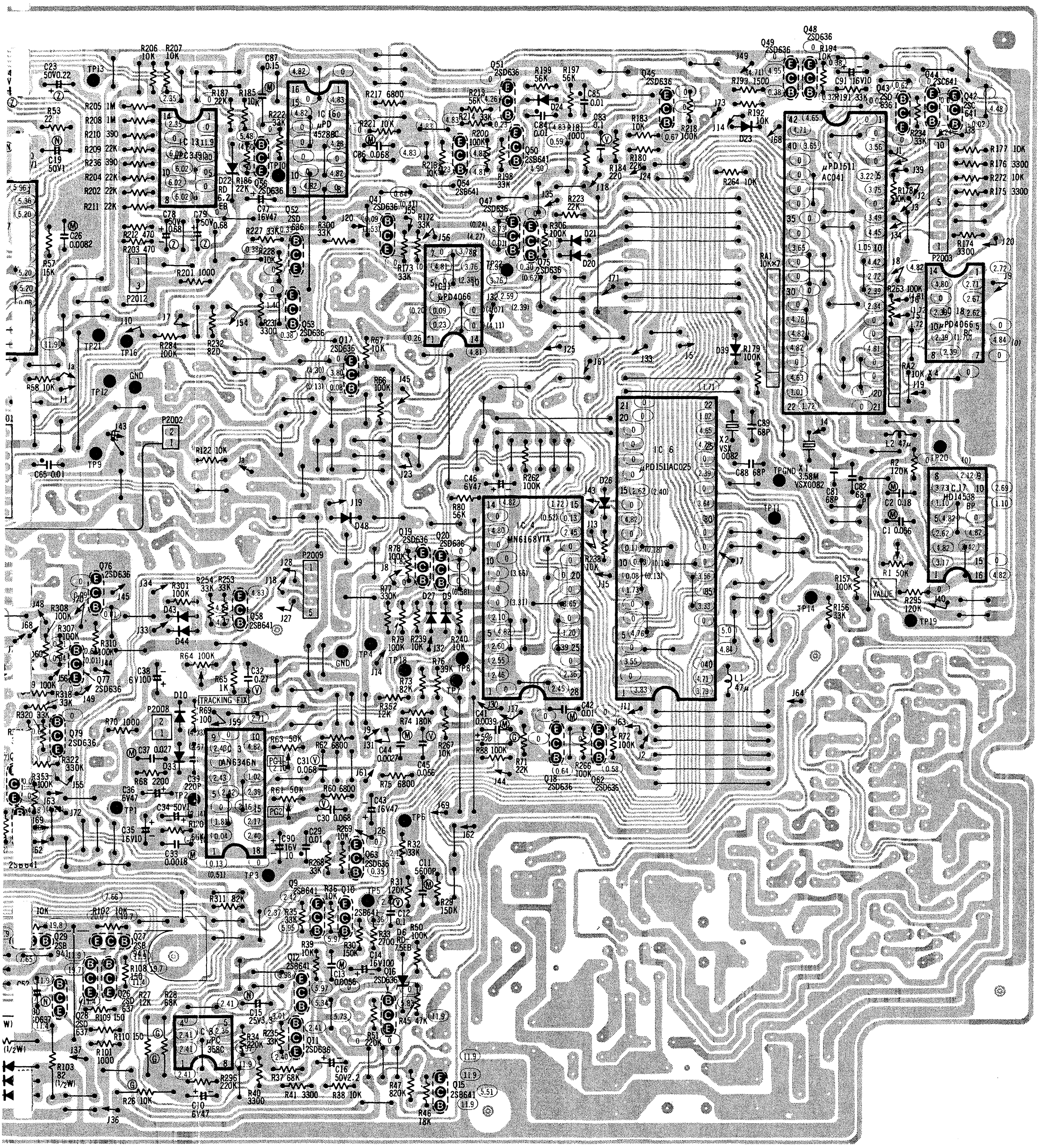
P2008 TO CTL HEAD

1	CTL. HEAD ⊖
2	CTL. HEAD ⊕

P2009 TO FRONT JACK P6564

1	TRACKING VR ⊕
2	TRACKING VR ⊖
3	————
4	————
5	————

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets (   ) are measured in RECORD mode.)


IC 6
µPD1511AC025
IC 4
MN6168VIA
IC 7
µPD1511
AC041
µPD4066
µPD4528BC
HD14538
AN6346N
X2
3.58M
P2002
P2008
P2009
P2012
P2003
TRACKING FIX
X-VALUE
GND
TP1
TP3
TP4
TP6
TP9
TP10
TP11
TP12
TP14
TP15
TP16
TP21
5
6
7
8
9

P2003 TO SYSTEM CONTROL P6007

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	GND
4	SERIAL CLOCK
5	SERIAL DATA
6	POWER RESET
7	CTL. PULSE
8	REEL MOTOR CTL
9	CLEAR TAPE Ⓗ
10	POWER STOP Ⓗ

REF. NO. 2000 SERIES

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

E & MINANCE P3302

P2012 TO CAPSTAN MOTOR

1	PHOTO FG1
2	GND
3	PHOTO FG2

P2010 TO FAN MOTOR CONN. P6761

1	HOUR METER ON Ⓛ
2	———————

P2008 TO CTL HEAD

1	CTL. HEAD ⊖
2	CTL. HEAD ⊕

P2009 TO FRONT JACK P6564

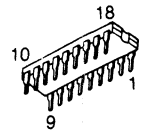
1	TRACKING VR ⊕
2	TRACKING VR ⊖
3	———————
4	———————
5	———————

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

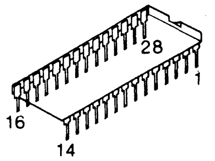
Cylinder & Capastan Servo C.B.A. (VEP02164D)			
Q2002	E-2	Q2049	F-8
Q2003	D-2	Q2050	F-7
Q2004	D-2	Q2051	F-7
Q2005	D-2	Q2052	E-6
Q2006	D-2	Q2053	E-6
Q2007	D-2	Q2054	F-6
Q2008	D-2	Q2056	F-5
Q2009	B-6	Q2058	D-5
Q2010	B-6	Q2060	E-2
Q2011	B-6	Q2061	D-2
Q2012	B-6	Q2062	C-7
Q2015	B-6	Q2063	C-6
Q2016	B-6	Q2065	C-2
Q2017	E-6	Q2068	D-2
Q2018	C-7	Q2069	D-2
Q2019	D-6	Q2075	E-7
Q2020	D-6	Q2076	D-5
Q2021	B-3	Q2077	C-5
Q2022	B-4	Q2078	C-4
Q2023	B-4	Q2079	C-5
Q2025	B-3	Q2080	C-4
Q2026	B-5	Q2086	C-4
Q2027	B-5	Q2091	C-4
Q2028	B-5		
Q2029	B-4	IC2001	D-3
Q2030	B-5	IC2002	E-4
Q2031	B-4	IC2003	C-5
Q2032	B-2	IC2004	D-7
Q2033	B-3	IC2005	C-2
Q2034	B-3	IC2006	D-7
Q2035	C-2	IC2007	E-8
Q2036	C-2	IC2008	B-5
Q2041	E-6	IC2009	B-3
Q2042	F-8	IC2011	E-6
Q2043	F-8	IC2013	F-5
Q2044	F-8	IC2014	F-2
Q2045	F-7	IC2016	F-6
Q2047	E-7	IC2017	D-8
Q2048	F-8	IC2018	E-9

Fan Motor Conn. C.B. (VJB00B30)	
Q6767	D-1
Q6768	D-1

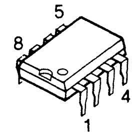
Servo C.B.A. ICs & Transistors Information



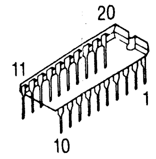
AN6346N



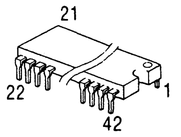
MN6168VIA



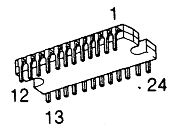
µPC358C



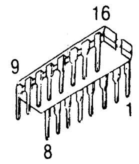
AN6357N



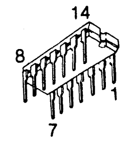
µPD1511AC



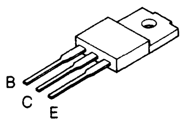
AN640G
AN6677



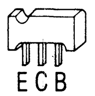
HD14538BP
µPD4528BC



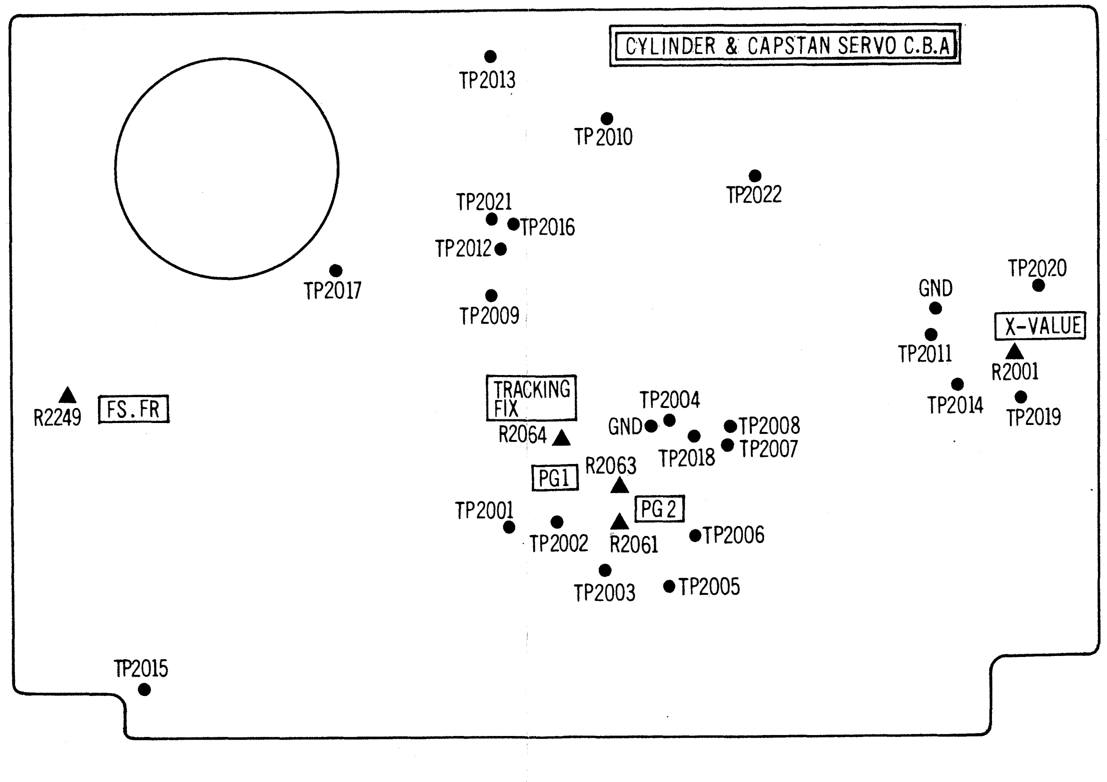
µPC339C
µPD4013BC
µPD4066BC



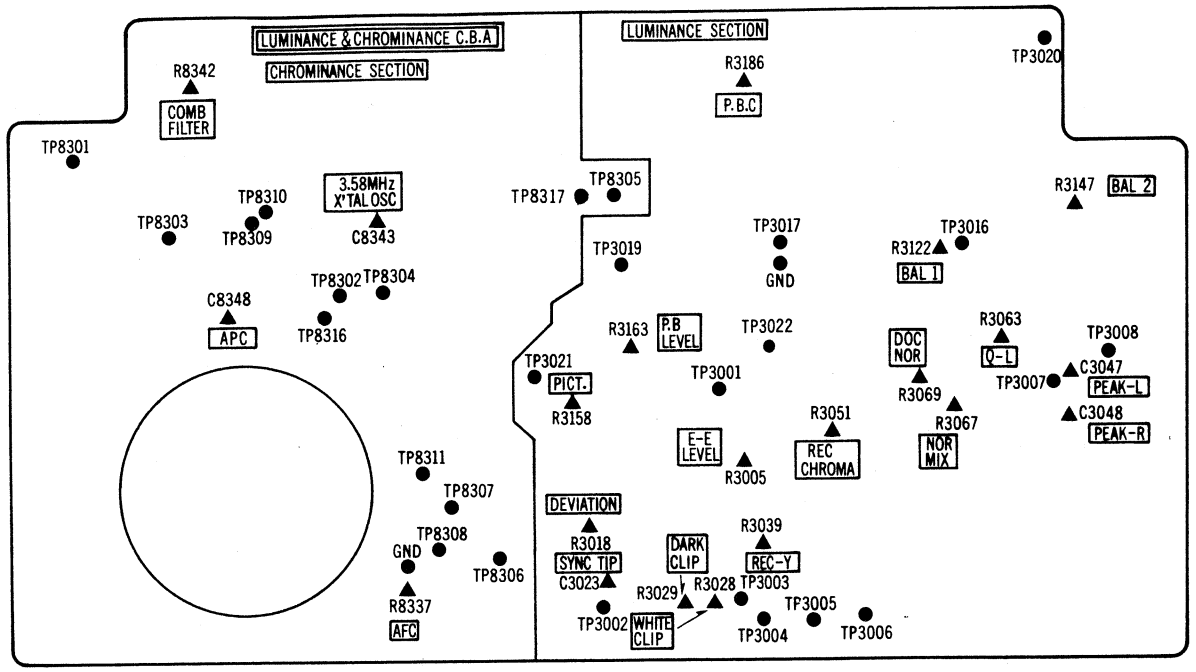
2SB941
2SD1266



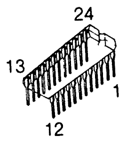
2SA886V
2SB641
2SC641
2SD636
2SD637
2SD638


CYLINDER & CAPSTAN SERVO C.B.A
TP2013
TP2010
TP2022
TP2021
TP2016
TP2012
TP2017
TP2009
TP2020
GND
X-VALUE
TP2011
R2001
TP2014
TP2019
R2249
FS.FR
TRACKING FIX
R2064
TP2004
GND
TP2008
TP2007
TP2018
R2063
PG1
PG2
TP2001
TP2002
R2061
TP2006
TP2003
TP2005
TP2015

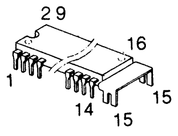
Luminance & Chrominance C.B.A. (VEP03164E)			
Q3001	C-8	Q3031	D-5
Q3002	A-4	Q3032	D-5
Q3003	A-5	Q3033	D-5
Q3004	A-6	Q3041	A-1
Q3005	A-6	Q3042	A-1
Q3006	B-5	Q3043	A-1
Q3007	B-6	Q3044	A-1
Q3008	A-6	Q8301	C-2
Q3009	A-6	Q8303	C-2
Q3010	B-8	Q8305	D-2
Q3011	C-7	Q8306	D-2
Q3012	B-7	Q8310	C-3
Q3016	C-6	Q8311	D-4
Q3017	D-7	Q8312	D-3
Q3018	D-7	Q8314	D-3
Q3020	D-7	Q8336	B-1
Q3021	C-7		
Q3022	C-7	IC3001	A-5
Q3023	C-7	IC3002	B-7
Q3024	D-7	IC3005	D-8
Q3025	C-5	IC3006	D-6
Q3026	C-5	IC8301	D-1
Q3027	C-4	IC8302	B-4
Q3030	D-5	IC8303	C-2


LUMINANCE & CHROMINANCE C.B.A
CHROMINANCE SECTION
LUMINANCE SECTION
R8342
COMB FILTER
TP8301
TP8310
TP8303
TP8309
3.58MHz X'TAL OSC
C8343
TP8302
TP8304
C8348
APC
TP8316
TP8311
TP8307
TP8308
GND
TP8306
R8337
AFC
R3186
P.B.C
TP3020
TP8317
TP8305
R3147
BAL 2
TP3019
TP3017
GND
R3122
TP3016
BAL 1
R3163
P.B LEVEL
TP3022
R3063
TP3008
DOC NOR
Q-L
C3047
TP3021
PICT.
R3158
TP3001
R3069
TP3007
PEAK-L
R3051
R3067
C3048
PEAK-R
E-E LEVEL
R3005
REC CHROMA
NOR MIX
DEVIATION
R3018
SYNC TIP
C3023
DARK CLIP
R3039
REC-Y
R3029
R3028
TP3003
TP3002
WHITE CLIP
TP3004
TP3005
TP3006

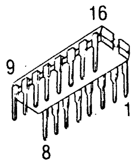
Luminance & Chrominance C.B.A. ICs & Transistors Information



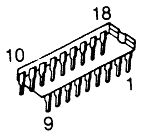
AN6310


2 9
16
1
14
15
15

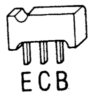
AN6332



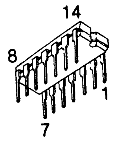
AN6361N



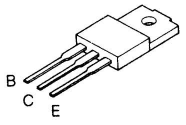
AN6360
AN6362



2SB641
2SB643
2SC2206
2SC2377
2SD636
2SD638

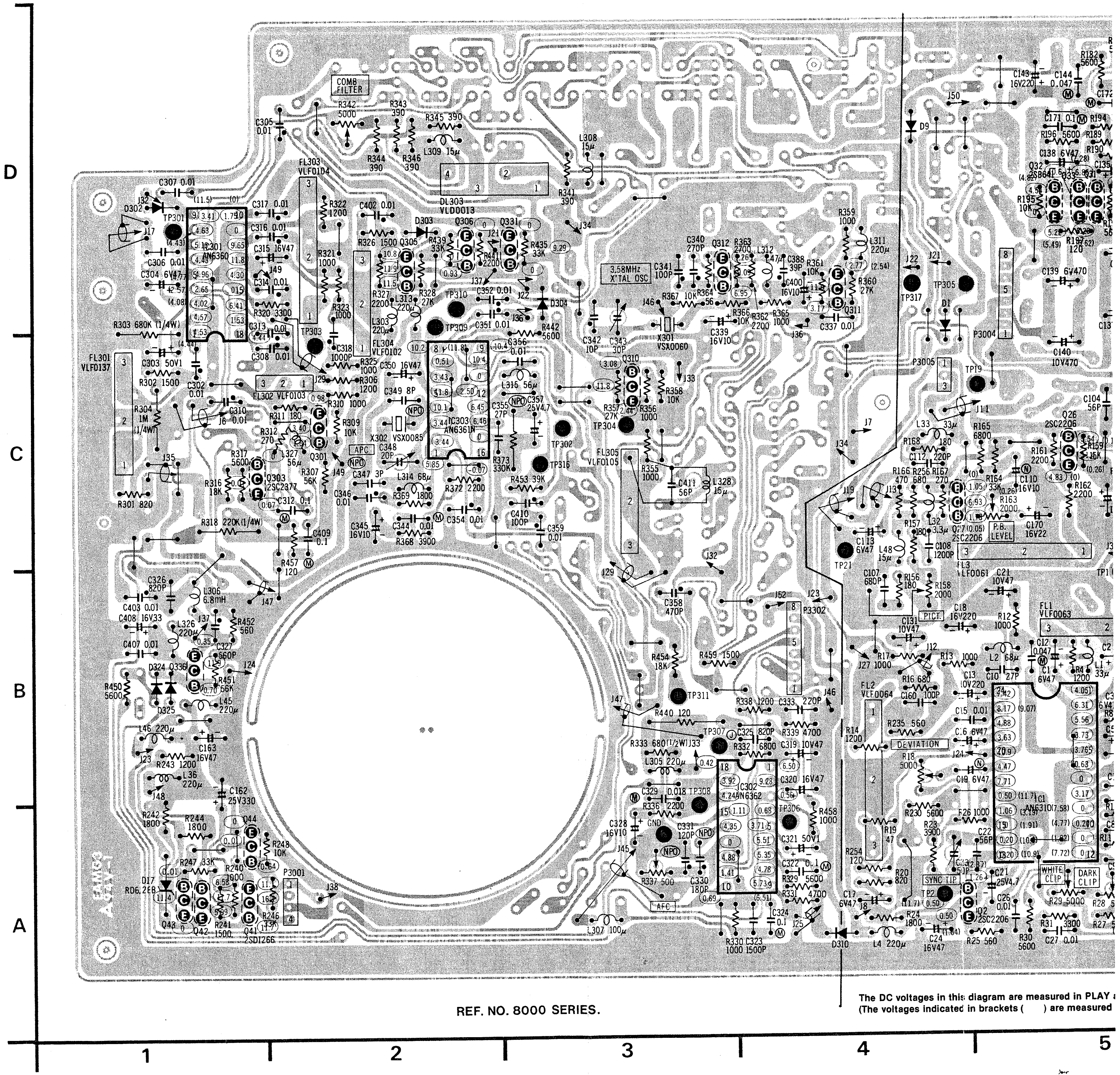


AN6320N
SN76670N



2SD1266

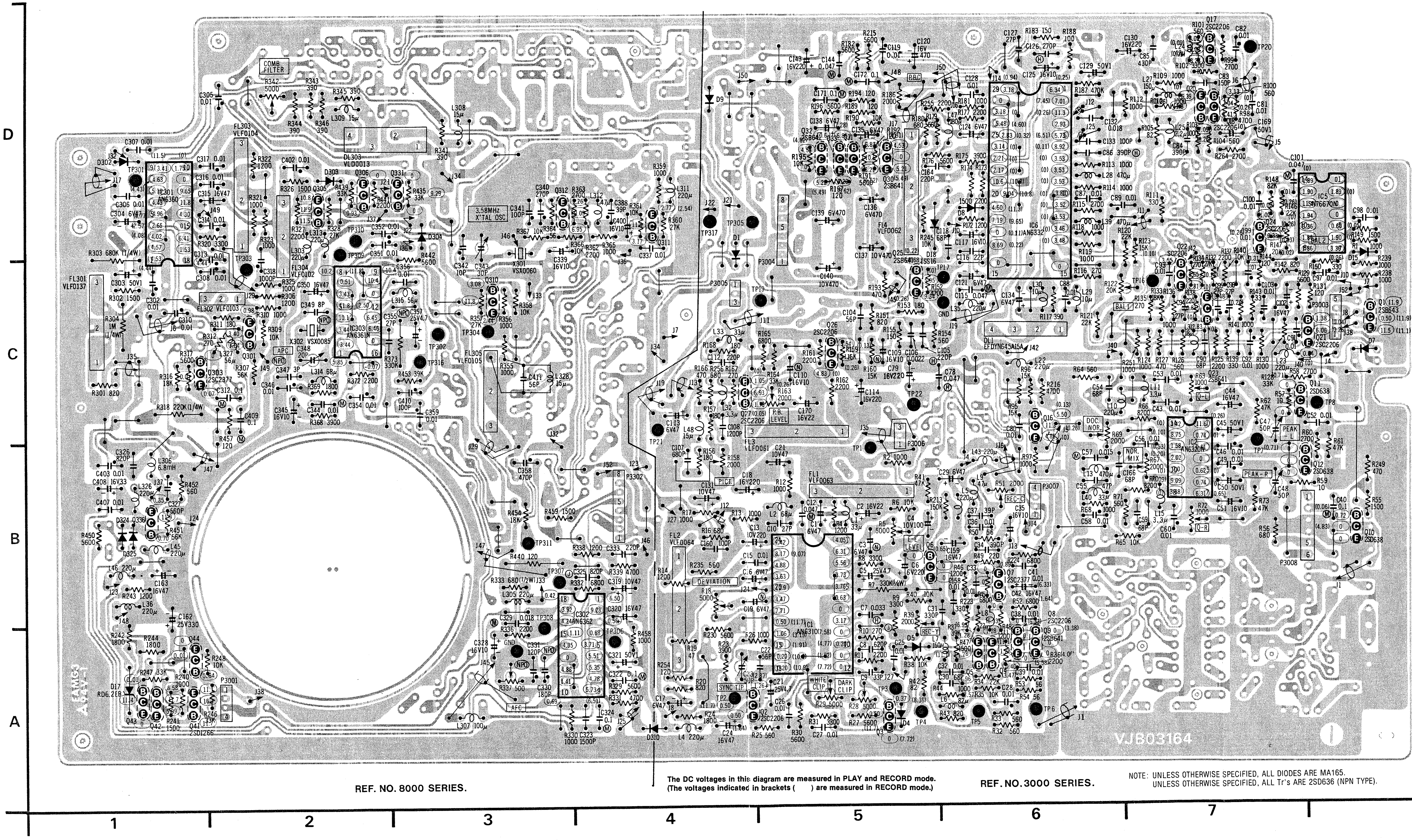
LUMINANCE & CHROMINANCE C.B.A. (VEP03164E)



REF. NO. 8000 SERIES.

The DC voltages in this diagram are measured in PLAY
(The voltages indicated in brackets ( ) are measured

LUMINANCE & CHROMINANCE C.B.A. (VEP03164E)



REF. NO. 8000 SERIES.

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

REF. NO. 3000 SERIES.

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165.
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

P8302 TO SERVO P2001

1	GND
2	———
3	HSS OUT
4	GND
5	ROTARY
6	3.58MHz
7	GND
8	E-E Ⓗ

P3001 TO POWER SUPPLY P1001

1	REG +12V
2	———
3	GND
4	UNREG +17V

P3003 TO AUDIO CONTROL P4105

1	PLAY +12V
2	REC/PLAY+12V
3	E-E/V-V
4	GND
5	———

P3004 TO REAR JACK P6664

1	VIDEO OUT LINE
2	GND
3	VIDEO OUT 8P
4	GND
5	———
6	———
7	———
8	———

P3005 TO AUDIO CONTROL P4105

1	RF OUT
2	GND
3	HEAD SW

P3006 TO REAR JACK P6668

1	VIDEO IN
2	GND
3	———

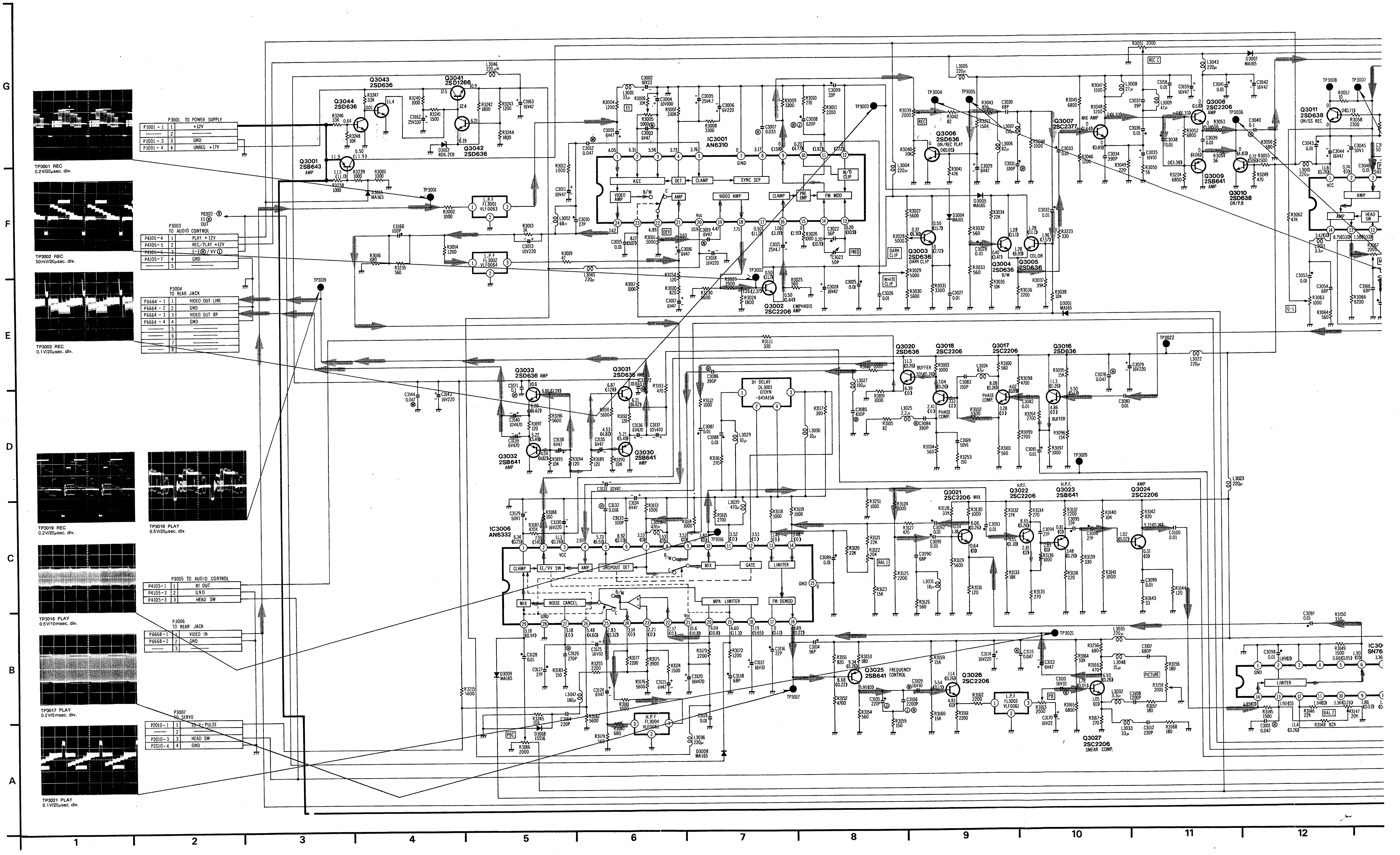
P3008 TO VIDEO HEADS

1	VIDEO HEAD (L)
2	VIDEO HEAD (L)
3	GND
4	GND
5	VIDEO HEAD (R)
6	VIDEO HEAD (R)

P3007 TO SERVO P2010

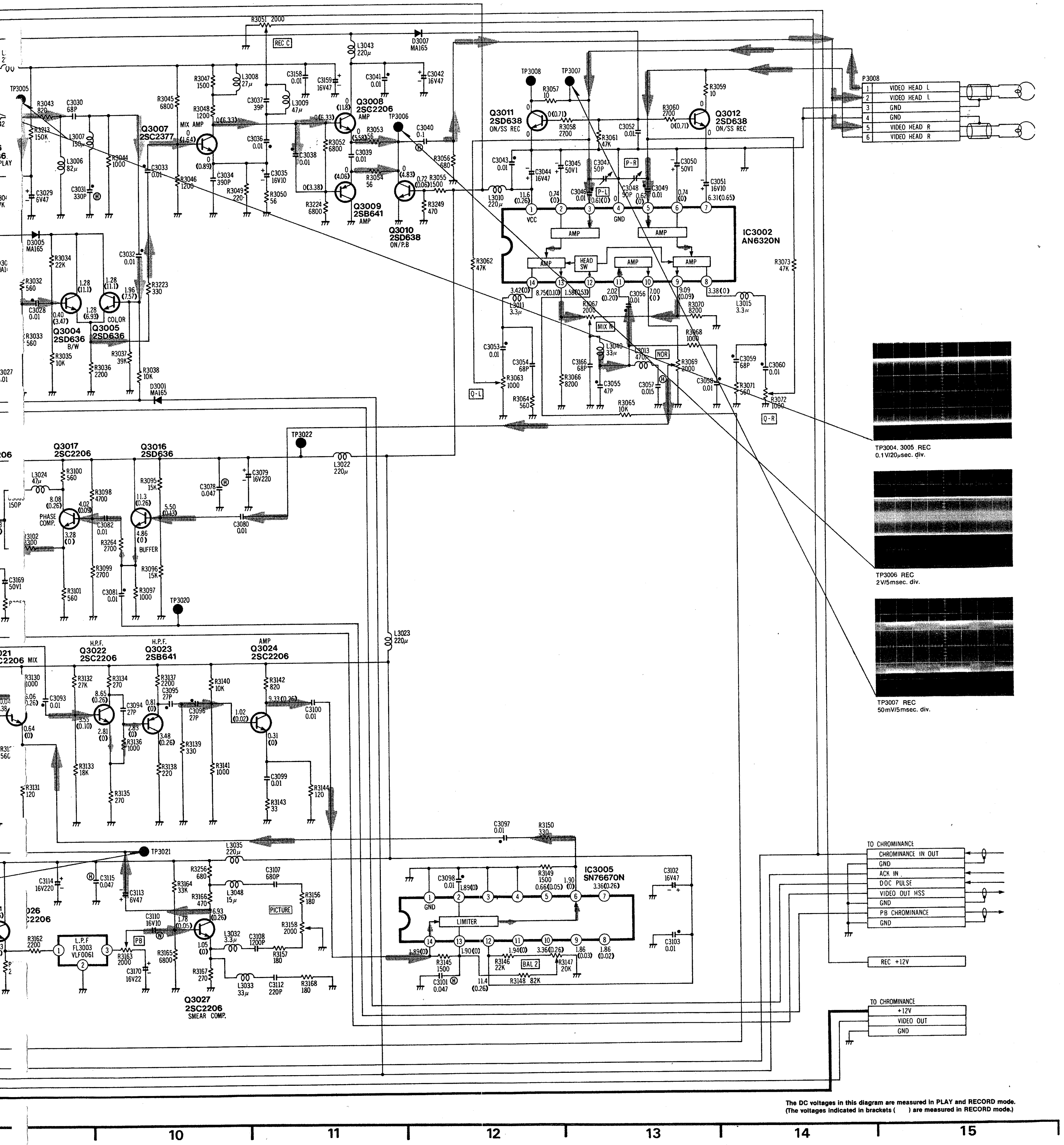
1	SS V-PULSE
2	———
3	HEAD SW
4	GND

LUMINANCE PROCESS SCHEMATIC DIAGRAM



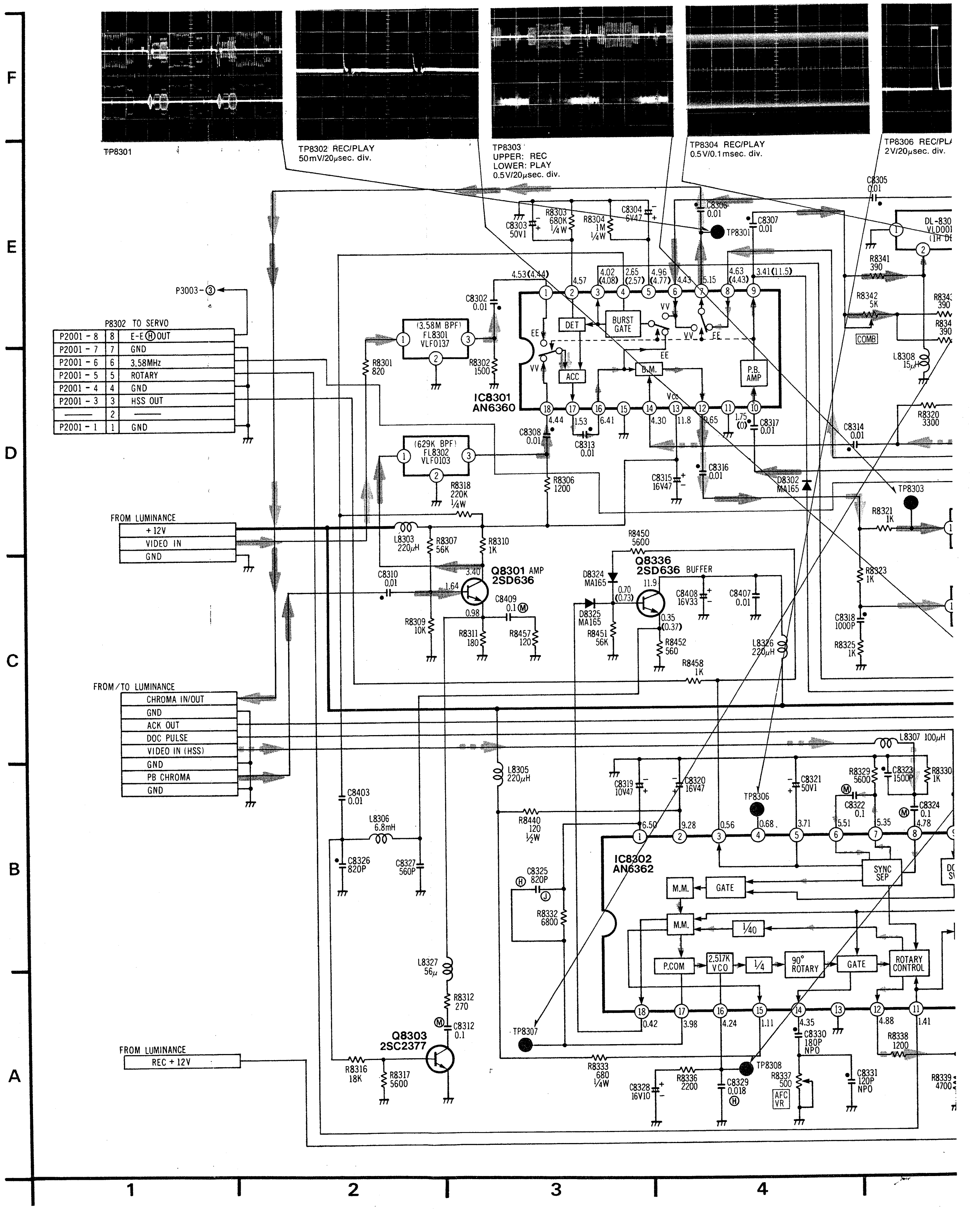
TP3001 REC 0.2V/20μsec. div.
TP3002 REC 50mV/20μsec. div.
TP3003 REC 0.1V/20μsec. div.
TP3019 REC 0.2V/20μsec. div.
TP3019 PLAY 0.5V/20μsec. div.
TP3016 PLAY 0.5V/10msec. div.
TP3017 PLAY 0.2V/5msec. div.
TP3021 PLAY 0.1V/20μsec. div.
P3001 TO POWER SUPPLY
P1001 - 1 | 1 | +12V
2
P1001 - 3 | 3 | GND
P1001 - 4 | 4 | UNREG +17V
P8302 - ⑧ EE Ⓗ OUT
P3003 TO AUDIO CONTROL
P4105 - 4 | 1 | PLAY +12V
P4105 - 5 | 2 | REC/PLAY +12V
P4105 - 6 | 3 | E-E Ⓗ / VV Ⓛ
P4105 - 7 | 4 | GND
5
P3004 TO REAR JACK
P6664 - 1 | 1 | VIDEO OUT LINE
P6664 - 2 | 2 | GND
P6664 - 3 | 3 | VIDEO OUT 8P
P6664 - 4 | 4 | GND
5
6
7
8
P3005 TO AUDIO CONTROL
P4105-1 | 1 | RF OUT
P4105-2 | 2 | GND
P4105-3 | 3 | HEAD SW
P3006 TO REAR JACK
P6668-1 | 1 | VIDEO IN
P6668-2 | 2 | GND
3
P3007 TO SERVO
P2010-1 | 1 | SS V-PULSE
2
P2010-3 | 3 | HEAD SW
P2010-4 | 4 | GND
Q3043 2SD636
Q3041 2SD1266
Q3044 2SD636
Q3042 2SD636
Q3001 2SB643 AMP
D3017 RD6.2EB
D3015 MA165
TP3001
TP3019
L.P.F FL3001 VLF0063
L.P.F FL3002 VLF0064
IC3001 AN6310
AGC
DET
CLAMP
SYNC SEP
VIDEO AMP
AMP
CLAMP
PRE EMP
FM MOD
W/D CLIP
B/W
C
DEV
FREQ
EE
TP3002
Q3002 2SC2206 EMPHASIS AMP
TP3003
TP3004
TP3005
Q3006 2SD636 ON/REC PLAY
Q3007 2SC2377 MIX AMP
REC
D3005 MA165
D3004 MA165
Q3003 2SD636 DARK CLIP
DARK CLIP
WHITE CLIP
Q3004 2SD636 B/W
Q3005 2SD636 COLOR
D3001 MA165
REC C
D3007 MA165
Q3008 2SC2206 AMP
Q3009 2SB641 AMP
Q3010 2SD638 ON/P.B
TP3006
TP3008
TP3007
Q3011 2SD638 ON/SS REC
AMP
HEAD SW
Q-L
TP3022
Q3033 2SD636 AMP
Q3031 2SD636 AMP
Q3032 2SB641 AMP
Q3030 2SB641 AMP
1H DELAY DL3001 EFDYN-645A15A
Q3020 2SD636 BUFFER
Q3018 2SC2206 PHASE COMP.
Q3017 2SC2206 PHASE COMP.
Q3016 2SD636 BUFFER
TP3020
IC3006 AN6332
CLAMP
EE/VV SW
AMP
DROPOUT DET
MIX
GATE
LIMITER
NOISE CANCEL
MPA LIMITER
FM DEMOD
GND
VCC
TP3016
BAL 1
Q3021 2SC2206 MIX
Q3022 2SC2206 H.P.F.
Q3023 2SB641 H.P.F.
Q3024 2SC2206 AMP
D3009 MA165
D3018 1SS16
PBC
H.P.F FL3004 VLFE0061
D3008 MA165
TP3017
Q3025 2SB641 FREQUENCY CONTROL
Q3026 2SC2206
L.P.F FL3003 VLF0061
PB
TP3021
Q3027 2SC2206 SMEAR COMP.
PICTURE
IC30 SN76
LIMITER
BAL 2
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12

MAIN SIGNAL PATH IN RECORD MODE
MAIN SIGNAL PATH IN PLAYBACK MODE

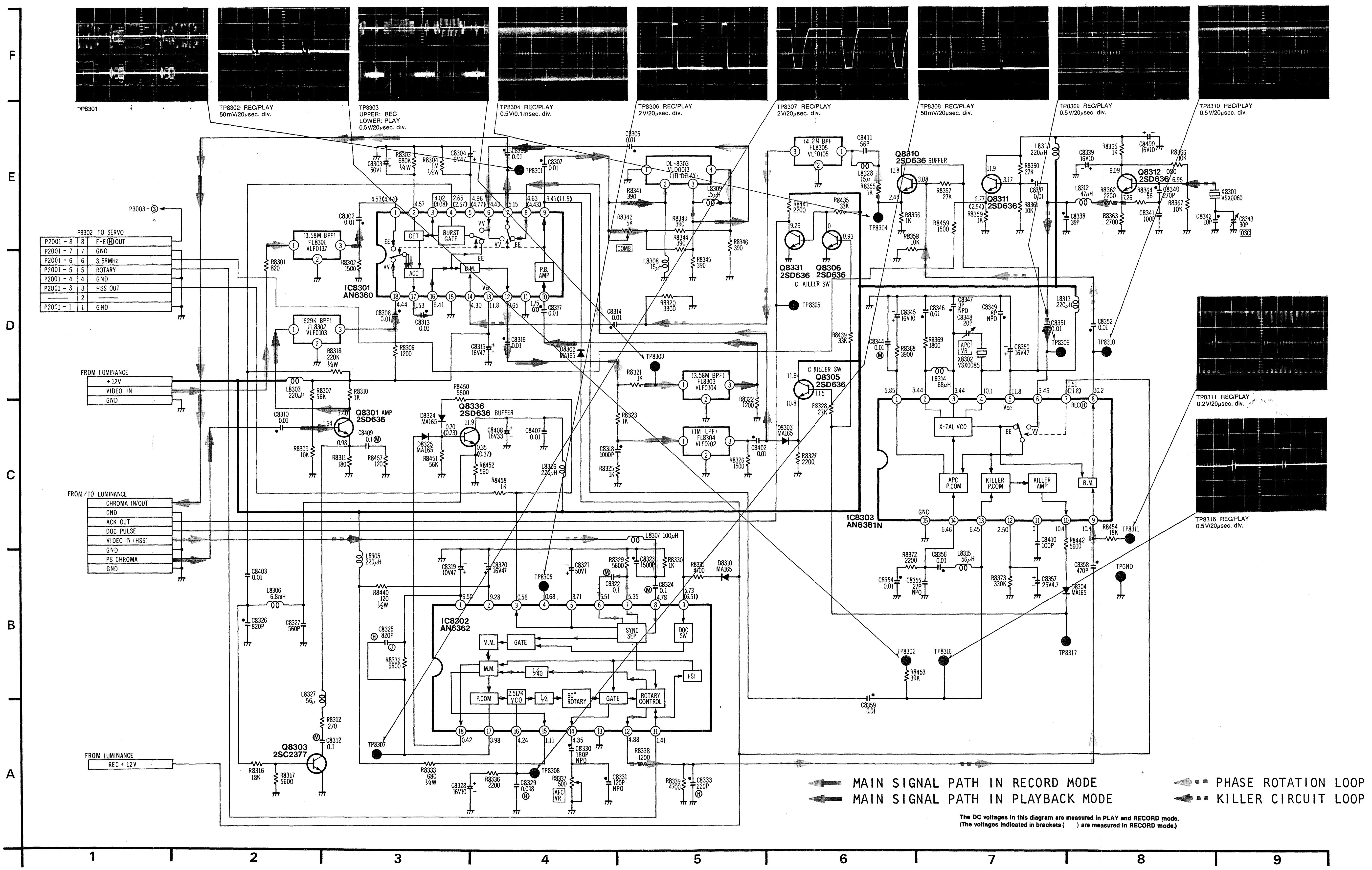

Q3007 2SC2377 MIX AMP
Q3008 2SC2206 AMP
Q3009 2SB641 AMP
Q3010 2SD638 ON/P.B
Q3011 2SD638 ON/SS REC
Q3012 2SD638 ON/SS REC
IC3002 AN6320N
Q3004 2SD636 B/W
Q3005 2SD636 COLOR
Q3017 2SC2206
Q3016 2SD636
Q3022 2SC2206 H.P.F.
Q3023 2SB641 H.P.F.
Q3024 2SC2206 AMP
Q3027 2SC2206 SMEAR COMP.
IC3005 SN76670N
LIMITER
L.P.F FL3003 VLF0061
P3008
VIDEO HEAD L
VIDEO HEAD L
GND
GND
VIDEO HEAD R
VIDEO HEAD R
TP3004, 3005 REC 0.1V/20μsec. div.
TP3006 REC 2V/5msec. div.
TP3007 REC 50mV/5msec. div.
TO CHROMINANCE
CHROMINANCE IN OUT
GND
ACK IN
DOC PULSE
VIDEO OUT HSS
GND
PB CHROMINANCE
GND
REC +12V
TO CHROMINANCE
+12V
VIDEO OUT
GND
10
11
12
13
14
15

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

CHROMINANCE PROCESS SCHEMATIC DIAGRAM

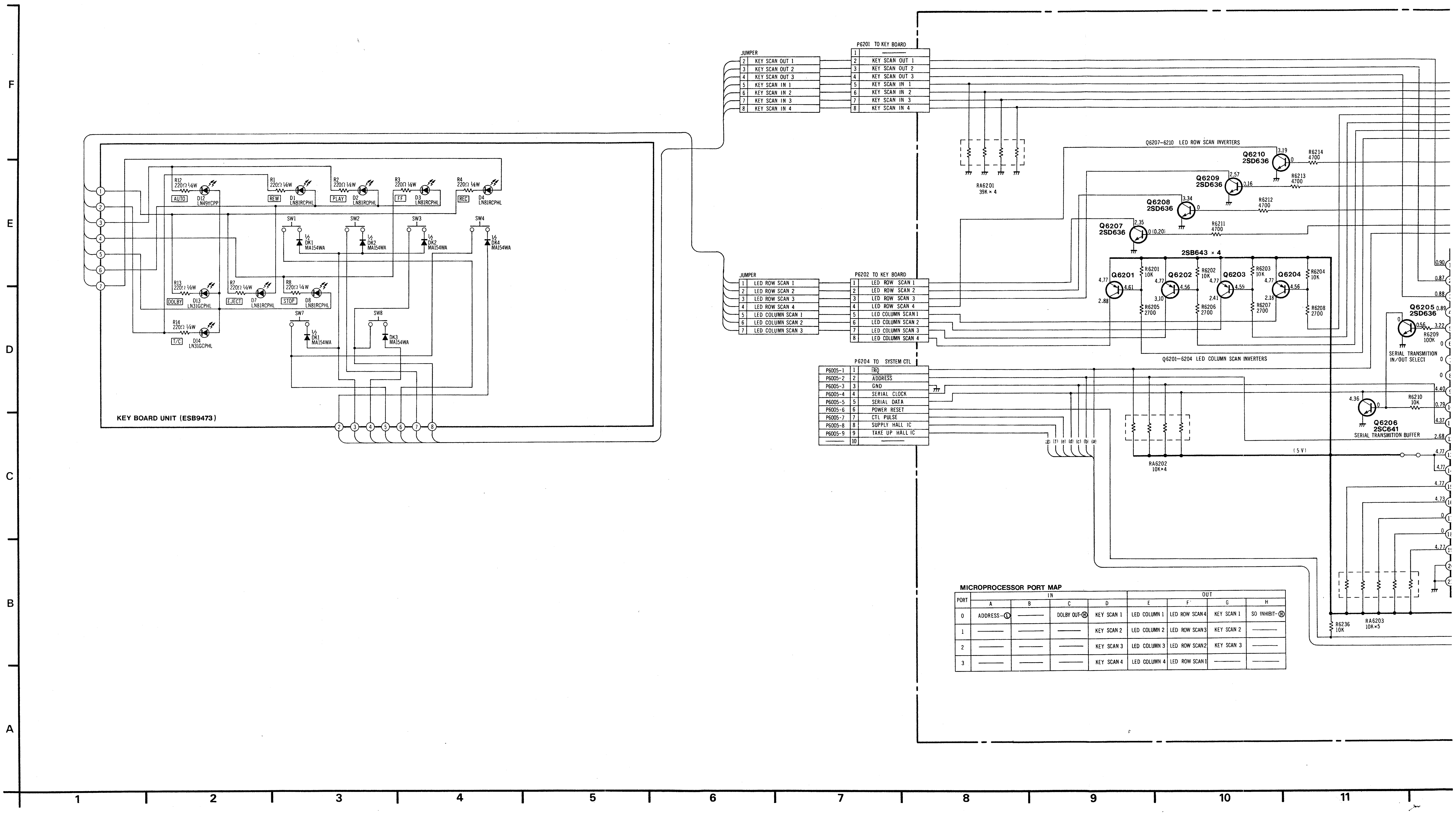

TP8301
TP8302 REC/PLAY 50mV/20μsec. div.
TP8303 UPPER: REC LOWER: PLAY 0.5V/20μsec. div.
TP8304 REC/PLAY 0.5V/0.1msec. div.
TP8306 REC/PL
2V/20μsec. div.
P8302 TO SERVO
P2001 - 8 E-E Ⓗ OUT
P2001 - 7 GND
P2001 - 6 3.58MHz
P2001 - 5 ROTARY
P2001 - 4 GND
P2001 - 3 HSS OUT
P2001 - 1 GND
IC8301 AN6360
(3.58M BPF) FL8301 VLF0137
(629K BPF) FL8302 VLF0103
DET
BURST GATE
ACC
B.M.
P.B. AMP
FROM LUMINANCE
+12V
VIDEO IN
GND
Q8301 2SD636 AMP
Q8336 2SD636 BUFFER
FROM/TO LUMINANCE
CHROMA IN/OUT
GND
ACK OUT
DOC PULSE
VIDEO IN (HSS)
GND
PB CHROMA
GND
IC8302 AN6362
M.M.
GATE
1/40
P.COM
2.517K VCO
1/4
90° ROTARY
ROTARY CONTROL
SYNC SEP
Q8303 2SC2377
FROM LUMINANCE
REC +12V
AFC VR
COMB
F
E
D
C
B
A
1
2
3
4

CHROMINANCE PROCESS SCHEMATIC DIAGRAM


F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
TP8301
TP8302 REC/PLAY 50mV/20μsec. div.
TP8303 UPPER: REC LOWER: PLAY 0.5V/20μsec. div.
TP8304 REC/PLAY 0.5V/0.1msec. div.
TP8306 REC/PLAY 2V/20μsec. div.
TP8307 REC/PLAY 2V/20μsec. div.
TP8308 REC/PLAY 50mV/20μsec. div.
TP8309 REC/PLAY 0.5V/20μsec. div.
TP8310 REC/PLAY 0.5V/20μsec. div.
TP8311 REC/PLAY 0.2V/20μsec. div.
TP8316 REC/PLAY 0.5V/20μsec. div.
P3003-③
P8302 TO SERVO
P2001 - 8 | 8 | E-E Ⓗ OUT
P2001 - 7 | 7 | GND
P2001 - 6 | 6 | 3.58MHz
P2001 - 5 | 5 | ROTARY
P2001 - 4 | 4 | GND
P2001 - 3 | 3 | HSS OUT
2
P2001 - 1 | 1 | GND
FROM LUMINANCE
+12V
VIDEO IN
GND
FROM/TO LUMINANCE
CHROMA IN/OUT
GND
ACK OUT
DOC PULSE
VIDEO IN (HSS)
GND
PB CHROMA
GND
FROM LUMINANCE
REC +12V
IC8301 AN6360
DET
BURST GATE
ACC
B.M.
P.B. AMP
(3.58M BPF) FL8301 VLF0137
(629K BPF) FL8302 VLF0103
Q8301 AMP 2SD636
Q8336 2SD636 BUFFER
Q8303 2SC2377
DL-8303 VLD0013 (1H DELAY)
COMB
(3.58M BPF) FL8303 VLF0104
(1M LPF) FL8304 VLF0102
(4.2M BPF) FL8305 VLF0105
Q8310 2SD636 BUFFER
Q8311 2SD636
Q8312 2SD636 OSC
X8301 VSX0060
Q8331 2SD636
Q8306 2SD636
C KILLER SW
Q8305 2SD636
C KILLER SW
TP8305
APC VR
X8302 VSX0085
IC8303 AN6361N
X-TAL VCO
APC P.COM
KILLER P.COM
KILLER AMP
B.M.
REC Ⓗ
Vcc
EE
VV
IC8302 AN6362
M.M.
GATE
SYNC SEP
DOC SW
1/40
FSI
P.COM
2.517K VCO
1/4
90° ROTARY
GATE
ROTARY CONTROL
AFC VR
TP8302
TP8316
TP8317
TPGND
TP8306
TP8307
TP8308
MAIN SIGNAL PATH IN RECORD MODE
MAIN SIGNAL PATH IN PLAYBACK MODE
PHASE ROTATION LOOP
KILLER CIRCUIT LOOP

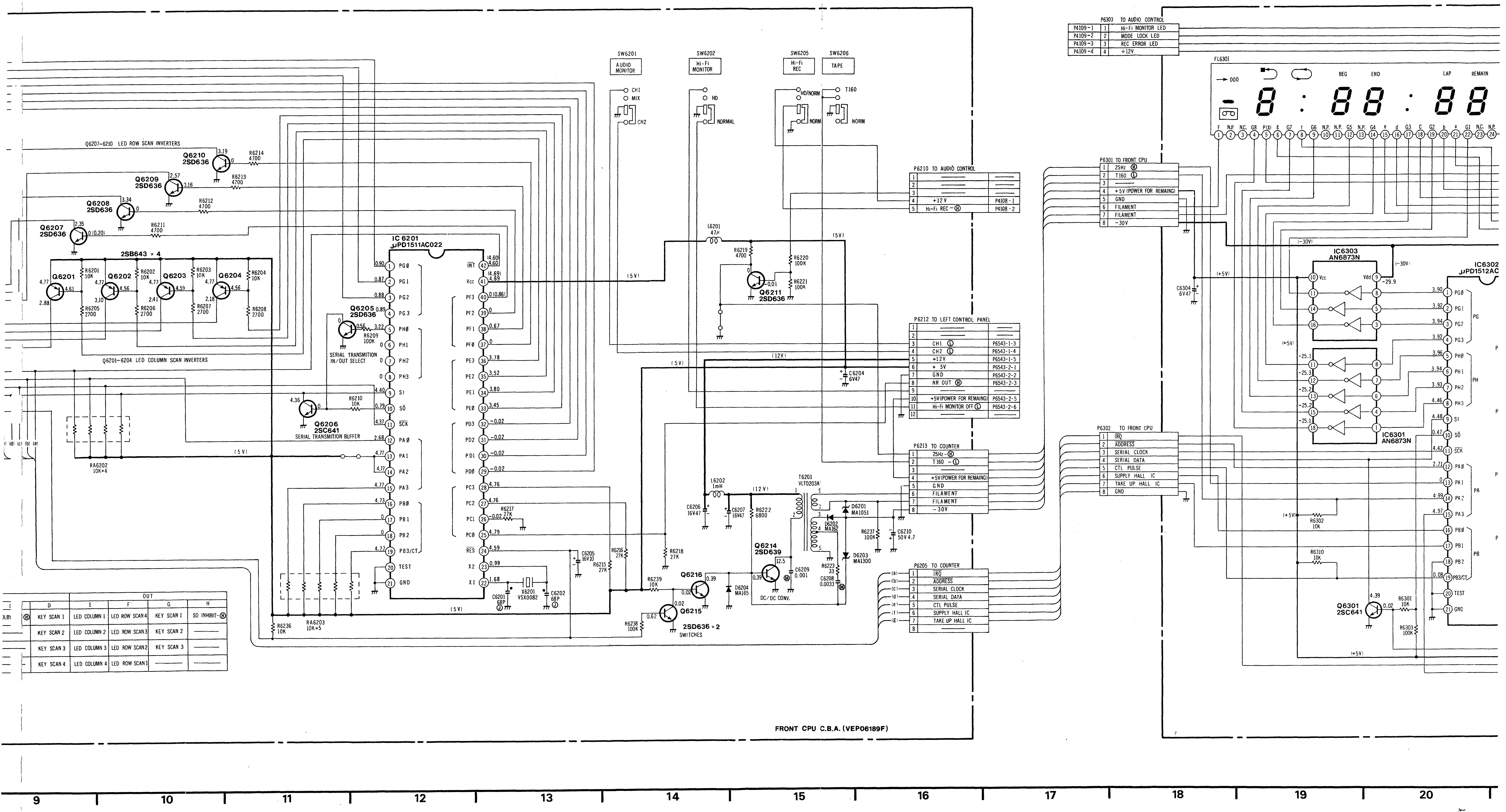
The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

FRONT CPU, COUNTER & KEY BOARD SCHEMATIC DIAGRAM


F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
KEY BOARD UNIT (ESB9473)
R12 220Ω ¼W
AUTO
D12 LN49YCPP
R1 220Ω ¼W
REW
D1 LN81RCPHL
R2 220Ω ¼W
PLAY
D2 LN81RCPHL
R3 220Ω ¼W
FF
D3 LN81RCPHL
R4 220Ω ¼W
REC
D4 LN81RCPHL
SW1
SW2
SW3
SW4
½ DK1 MA154WA
½ DK2 MA154WA
½ DK2 MA154WA
½ DK4 MA154WA
R13 220Ω ¼W
DOLBY
D13 LN31GCPHL
R7 220Ω ¼W
EJECT
D7 LN81RCPHL
R8 220Ω ¼W
STOP
D8 LN81RCPHL
SW7
SW8
½ DK1 MA154WA
DK3 MA154WA
R14 220Ω ¼W
T/C
D14 LN31GCPHL
JUMPER
2 KEY SCAN OUT 1
3 KEY SCAN OUT 2
4 KEY SCAN OUT 3
5 KEY SCAN IN 1
6 KEY SCAN IN 2
7 KEY SCAN IN 3
8 KEY SCAN IN 4
P6201 TO KEY BOARD
1 ———
2 KEY SCAN OUT 1
3 KEY SCAN OUT 2
4 KEY SCAN OUT 3
5 KEY SCAN IN 1
6 KEY SCAN IN 2
7 KEY SCAN IN 3
8 KEY SCAN IN 4
JUMPER
1 LED ROW SCAN 1
2 LED ROW SCAN 2
3 LED ROW SCAN 3
4 LED ROW SCAN 4
5 LED COLUMN SCAN 1
6 LED COLUMN SCAN 2
7 LED COLUMN SCAN 3
P6202 TO KEY BOARD
1 LED ROW SCAN 1
2 LED ROW SCAN 2
3 LED ROW SCAN 3
4 LED ROW SCAN 4
5 LED COLUMN SCAN 1
6 LED COLUMN SCAN 2
7 LED COLUMN SCAN 3
8 LED COLUMN SCAN 4
P6204 TO SYSTEM CTL
P6005-1 1 IRQ
P6005-2 2 ADDRESS
P6005-3 3 GND
P6005-4 4 SERIAL CLOCK
P6005-5 5 SERIAL DATA
P6005-6 6 POWER RESET
P6005-7 7 CTL PULSE
P6005-8 8 SUPPLY HALL IC
P6005-9 9 TAKE UP HALL IC
——— 10 ———
RA6201 39K × 4
Q6207–6210 LED ROW SCAN INVERTERS
Q6210 2SD636
3.19
0
R6214 4700
Q6209 2SD636
2.57
0.16
R6213 4700
Q6208 2SD636
3.34
0
R6212 4700
Q6207 2SD636
2.35
0 (0.20)
R6211 4700
2SB643 × 4
Q6201
Q6202
Q6203
Q6204
4.77
4.61
2.88
4.77
4.56
3.10
4.77
4.59
2.41
4.77
4.56
2.18
R6201 10K
R6202 10K
R6203 10K
R6204 10K
R6205 2700
R6206 2700
R6207 2700
R6208 2700
Q6201–6204 LED COLUMN SCAN INVERTERS
Q6205 2SD636
0
0.56
R6209 100K
SERIAL TRANSMITION IN/OUT SELECT
Q6206 2SC641
4.36
0
R6210 10K
SERIAL TRANSMITION BUFFER
(g) (f) (e) (d) (c) (b) (a)
RA6202 10K×4
(5 V)
0.90
0.87
0.88
0.89
3.22
0
0
0
4.40
0.79
4.37
2.68
4.77
4.77
4.77
4.73
0
0
4.77
R6236 10K
RA6203 10K×5

MICROPROCESSOR PORT MAP

PORT	IN				OUT			
	A	B	C	D	E	F	G	H
0	ADDRESS-Ⓛ	———	DOLBY OUT-Ⓗ	KEY SCAN 1	LED COLUMN 1	LED ROW SCAN 4	KEY SCAN 1	SO INHIBIT-Ⓗ
1	———	———	———	KEY SCAN 2	LED COLUMN 2	LED ROW SCAN 3	KEY SCAN 2	———
2	———	———	———	KEY SCAN 3	LED COLUMN 3	LED ROW SCAN 2	KEY SCAN 3	———
3	———	———	———	KEY SCAN 4	LED COLUMN 4	LED ROW SCAN 1	———	———


Q6207~6210 LED ROW SCAN INVERTERS
Q6210 2SD636
Q6209 2SD636
Q6208 2SD636
Q6207 2SD636
R6214 4700
R6213 4700
R6212 4700
R6211 4700
2SB643 × 4
Q6201
Q6202
Q6203
Q6204
R6201 10K
R6202 10K
R6203 10K
R6204 10K
R6205 2700
R6206 2700
R6207 2700
R6208 2700
Q6201~6204 LED COLUMN SCAN INVERTERS
IC 6201 μPD1511AC022
Q6205 2SD636
R6209 100K
SERIAL TRANSMITION IN/OUT SELECT
Q6206 2SC641
R6210 10K
SERIAL TRANSMITION BUFFER
RA6202 10K×4
RA6203 10K×5
R6236 10K
PG0 PG1 PG2 PG3 PH0 PH1 PH2 PH3 SI SO SCK PA0 PA1 PA2 PA3 PB0 PB1 PB2 PB3/CT TEST GND
INT Vcc PF3 PF2 PF1 PF0 PE3 PE2 PE1 PE0 PD3 PD2 PD1 PD0 PC3 PC2 PC1 PC0 RES X2 X1
R6217 27K
C6205 16V10
R6216 27K
R6215 27K
C6201 68P
X6201 VSX0082
C6202 68P
SW6201 AUDIO MONITOR
CH1 MIX CH2
SW6202 Hi-Fi MONITOR
HD NORMAL
SW6205 Hi-Fi REC
HD/NORM NORM
SW6206 TAPE
T160 NORM
L6201 47μ
R6219 4700
R6220 100K
R6221 100K
Q6211 2SD636
C6204 6V47
(5V)
(12V)
L6202 1mH
C6206 16V47
C6207 16V47
R6222 6800
T6201 VLT0203A
D6201 MA1051
D6202 MA162
D6203 MA1300
R6237 100K
C6210 50V 4.7
Q6214 2SD639
C6209 0.001
R6223 33
C6208 0.0033
DC/DC CONV.
R6218 27K
Q6216
Q6215
R6239 10K
R6238 100K
D6204 MA165
2SD636 × 2 SWITCHES
P6303 TO AUDIO CONTROL
FL6301
→ 000
BEG END LAP REMAIN
F N.P. N.C. G8 P(X) g G7 f G6 N.P. N.P. G5 N.P. G4 e d G3 c G2 b a G1 N.C. N.P.
IC6303 AN6873N
Vcc Vdd
C6304 6V47
(+5V) (-30V)
IC6301 AN6873N
IC6302 μPD1512AC
PG0 PG1 PG2 PG3 PH0 PH1 PH2 PH3 SI SO SCK PA0 PA1 PA2 PA3 PB0 PB1 PB2 PB3/CT TEST GND
PG PH PA PB
R6302 10K
R6310 10K
Q6301 2SC641
R6301 10K
R6303 100K
FRONT CPU C.B.A. (VEP06189F)
9 10 11 12 13 14 15 16 17 18 19 20

P6210 TO AUDIO CONTROL

1	———	———
2	———	———
3	———	———
4	+12 V	P4108 - 1
5	Hi-Fi REC — Ⓗ	P4108 - 2

P6212 TO LEFT CONTROL PANEL

1	———	———
2	———	———
3	CH1 Ⓛ	P6543-1-3
4	CH2 Ⓛ	P6543-1-4
5	+12V	P6543-1-5
6	+ 5V	P6543-2-1
7	GND	P6543-2-2
8	NR OUT Ⓗ	P6543-2-3
9	———	———
10	+5V(POWER FOR REMAING)	P6543-2-5
11	Hi-Fi MONITOR OFF Ⓛ	P6543-2-6
12	———	———

P6213 TO COUNTER

1	25Hz - Ⓗ
2	T160 - Ⓛ
3	———
4	+5V(POWER FOR REMAING)
5	GND
6	FILAMENT
7	FILAMENT
8	- 30V

P6205 TO COUNTER

(a)	1	IRQ
(b)	2	ADDRESS
(c)	3	SERIAL CLOCK
(d)	4	SERIAL DATA
(e)	5	CTL PULSE
(f)	6	SUPPLY HALL IC
(g)	7	TAKE UP HALL IC
	8	———

P6303 TO AUDIO CONTROL

P4109 - 1	1	Hi-Fi MONITOR LED
P4109 - 2	2	MODE LOCK LED
P4109 - 3	3	REC ERROR LED
P4109 - 4	4	+12V

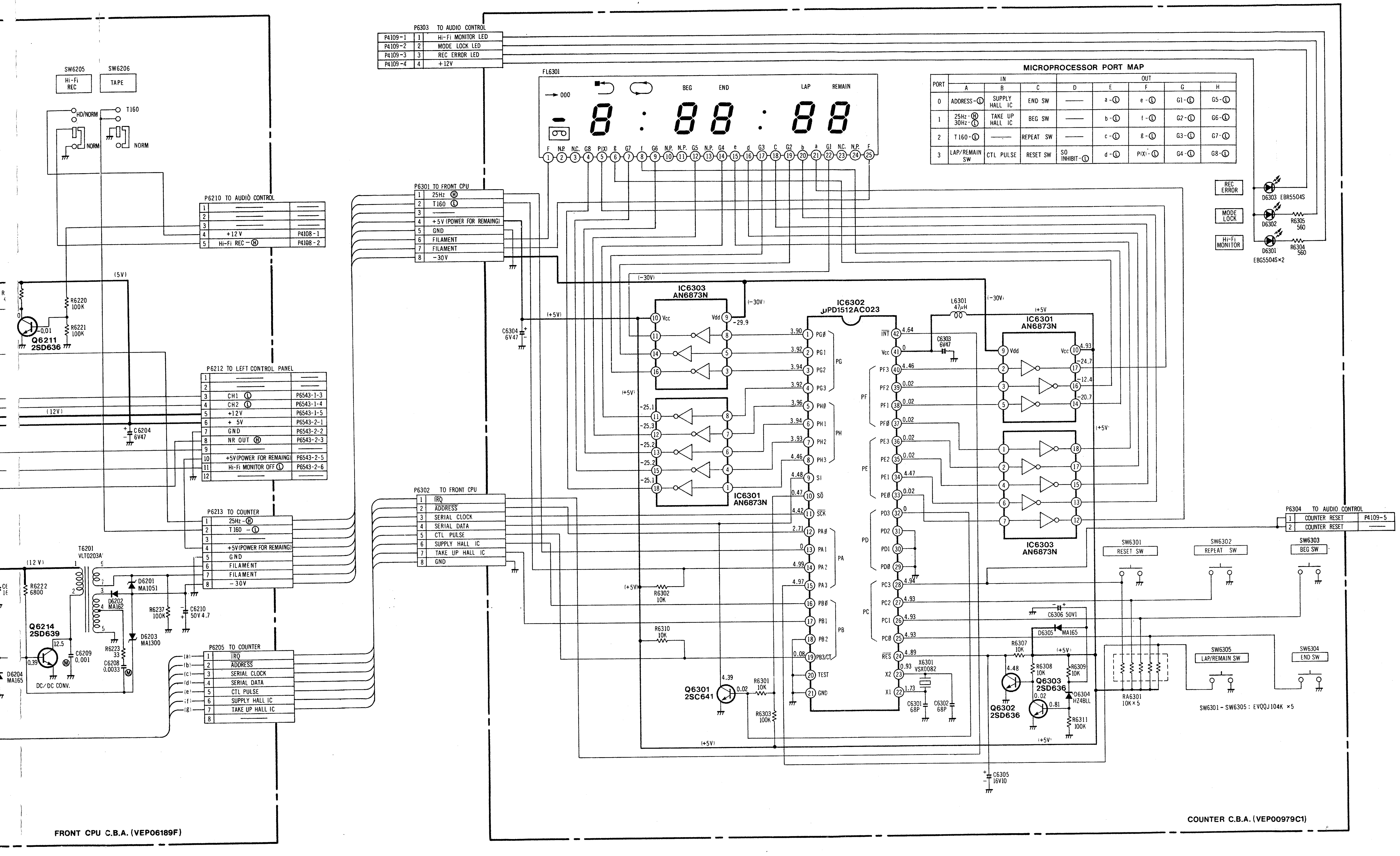
P6301 TO FRONT CPU

1	25Hz Ⓗ
2	T160 Ⓛ
3	———
4	+5V (POWER FOR REMAING)
5	GND
6	FILAMENT
7	FILAMENT
8	-30V

P6302 TO FRONT CPU

1	IRQ
2	ADDRESS
3	SERIAL CLOCK
4	SERIAL DATA
5	CTL PULSE
6	SUPPLY HALL IC
7	TAKE UP HALL IC
8	GND

	OUT				
(	D	E	F	G	H
OLBY Ⓗ	KEY SCAN 1	LED COLUMN 1	LED ROW SCAN 4	KEY SCAN 1	SO INHIBIT-Ⓗ
	KEY SCAN 2	LED COLUMN 2	LED ROW SCAN 3	KEY SCAN 2	———
	KEY SCAN 3	LED COLUMN 3	LED ROW SCAN 2	KEY SCAN 3	———
	KEY SCAN 4	LED COLUMN 4	LED ROW SCAN 1	———	———


P6303 TO AUDIO CONTROL
P4109-1 1 Hi-Fi MONITOR LED
P4109-2 2 MODE LOCK LED
P4109-3 3 REC ERROR LED
P4109-4 4 +12V
FL6301
SW6205 Hi-Fi REC
SW6206 TAPE
HD/NORM
T160
NORM
P6210 TO AUDIO CONTROL
+12V P4108-1
Hi-Fi REC P4108-2
P6301 TO FRONT CPU
25Hz
T160
+5V (POWER FOR REMAINS)
GND
FILAMENT
FILAMENT
-30V
BEG
END
LAP
REMAIN
R6220 100K
R6221 100K
Q6211 2SD636
P6212 TO LEFT CONTROL PANEL
CH1 P6543-1-3
CH2 P6543-1-4
+12V P6543-1-5
+5V P6543-2-1
GND P6543-2-2
NR OUT P6543-2-3
+5V (POWER FOR REMAINS) P6543-2-5
Hi-Fi MONITOR OFF P6543-2-6
C6204 6V47
C6304 6V47
IC6303 AN6873N
IC6302 µPD1512AC023
IC6301 AN6873N
L6301 47µH
C6303 6V47
P6213 TO COUNTER
P6302 TO FRONT CPU
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
CTL PULSE
SUPPLY HALL IC
TAKE UP HALL IC
GND
T6201 VLT0203A
D6201 MA1051
D6202 MA162
D6203 MA1300
R6222 6800
R6237 100K
C6210 50V4.7
Q6214 2SD639
C6209 0.001
R6223 33
C6208 0.0033
D6204 MA165
DC/DC CONV.
P6205 TO COUNTER
R6302 10K
R6310 10K
Q6301 2SC641
R6301 10K
R6303 100K
X6301 VSX0082
C6301 68P
C6302 68P
C6306 50V1
D6305 MA165
R6307 10K
R6308 10K
R6309 10K
Q6303 2SD636
Q6302 2SD636
D6304 HZ4BLL
R6311 100K
C6305 16V10
RA6301 10K×5
REC ERROR
MODE LOCK
Hi-Fi MONITOR
D6303 EBR5504S
D6302
D6301
R6305 560
R6304 560
EBG5504S×2
P6304 TO AUDIO CONTROL
COUNTER RESET P4109-5
COUNTER RESET
SW6301 RESET SW
SW6302 REPEAT SW
SW6303 BEG SW
SW6305 LAP/REMAIN SW
SW6304 END SW
SW6301 - SW6305 : EVQQJ104K ×5
FRONT CPU C.B.A. (VEP06189F)
COUNTER C.B.A. (VEP00979C1)

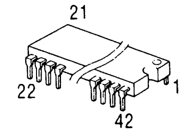
MICROPROCESSOR PORT MAP

PORT	IN			OUT				
	A	B	C	D	E	F	G	H
0	ADDRESS-Ⓛ	SUPPLY HALL IC	END SW	———	a-Ⓛ	e-Ⓛ	G1-Ⓛ	G5-Ⓛ
1	25Hz-Ⓗ 30Hz-Ⓛ	TAKE UP HALL IC	BEG SW	———	b-Ⓛ	f-Ⓛ	G2-Ⓛ	G6-Ⓛ
2	T160-Ⓛ	———	REPEAT SW	———	c-Ⓛ	g-Ⓛ	G3-Ⓛ	G7-Ⓛ
3	LAP/REMAIN SW	CTL PULSE	RESET SW	SO INHIBIT-Ⓛ	d-Ⓛ	P(X)-Ⓛ	G4-Ⓛ	G8-Ⓛ

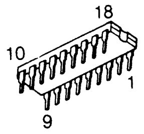
The DC voltages in this diagram are measured in PLAY mode.

15 16 17 18 19 20 21 22 23 24

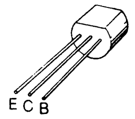
Front CPU & Counter C.B.A.
ICs & Transistors Information



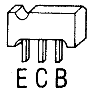
µPD1511AC
µPD1512AC



AN6873N



2SC641

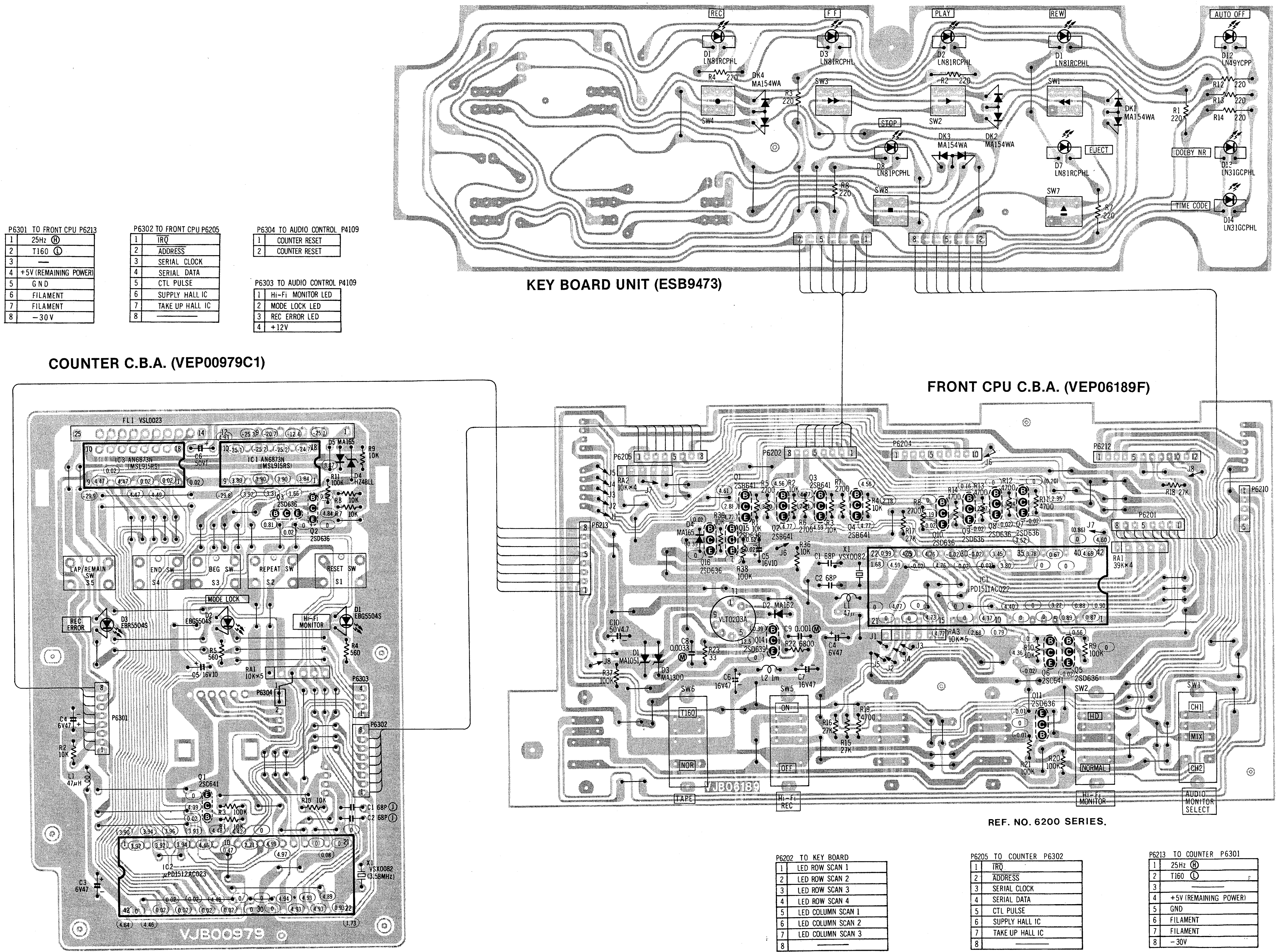


2SB643
2SD636
2SD639

Front CPU C.B.A. (VEP06189F)	
Q6201	C-5
Q6202	C-5
Q6203	C-5
Q6204	C-5
Q6205	B-7
Q6206	B-7
Q6207	C-6
Q6208	C-6
Q6209	C-6
Q6210	C-6
Q6211	B-6
Q6214	B-5
Q6215	C-5
Q6216	C-5
IC6201	C-6

Counter C.B.A (VEP00979C1)	
Q6301	B-2
Q6302	C-2
Q6303	C-2
IC6301	C-2
IC6302	A-2
IC6303	C-1

FRONT CPU C.B.A. (VEP06189F), COUNTER C.B.A. (VEP00979C1) & KEY BOARD UNIT (ESB9473)


REC
F F
PLAY
REW
AUTO OFF
STOP
EJECT
DOLBY NR
TIME CODE
D1 LN81RCPHL
D3 LN81RCPHL
D2 LN81RCPHL
D12 LN49YCPP
D8 LN81PCPHL
D7 LN81RCPHL
D13 LN31GCPHL
D14 LN31GCPHL
DK1 MA154WA
DK2 MA154WA
DK3 MA154WA
DK4 MA154WA
SW1
SW2
SW3
SW4
SW7
SW8
FL1 VSL0023
IC3 AN6873N (MSL915RS)
IC1 AN6873N (MSL915RS)
IC2 μPD1512AC023
X1 VSX0082 (3.58MHz)
LAP/REMAIN SW S5
END SW S4
BEG SW S3
REPEAT SW S2
RESET SW S1
MODE LOCK
REC ERROR
Hi-Fi MONITOR
D1 EBG5504S
D2 EBG5504S
D3 EBR5504S
P6301
P6302
P6303
P6304
VJB00979
P6201
P6202
P6204
P6205
P6210
P6212
P6213
IC1 μPD1512AC022
X1 VSX0082
VLT0203A
RA1 39K×4
RA2 10K×4
RA3 10K×5
SW5
SW6
T160
NOR
ON
OFF
TAPE
Hi-Fi REC
HD
NORMAL
Hi-Fi MONITOR
CH1
MIX
CH2
AUDIO MONITOR SELECT
VJB06189
A
B
C
D
E
F
1
2
3
4
5
6
7
8

KEY BOARD UNIT (ESB9473)

COUNTER C.B.A. (VEP00979C1)

REF. NO. 6300 SERIES.

FRONT CPU C.B.A. (VEP06189F)

REF. NO. 6200 SERIES.

P6301 TO FRONT CPU P6213

1	25Hz Ⓗ
2	T160 Ⓛ
3	—
4	+5V (REMAINING POWER)
5	GND
6	FILAMENT
7	FILAMENT
8	−30V

P6302 TO FRONT CPU P6205

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	SERIAL CLOCK
4	SERIAL DATA
5	CTL PULSE
6	SUPPLY HALL IC
7	TAKE UP HALL IC
8	———

P6304 TO AUDIO CONTROL P4109

1	COUNTER RESET
2	COUNTER RESET

P6303 TO AUDIO CONTROL P4109

1	Hi-Fi MONITOR LED
2	MODE LOCK LED
3	REC ERROR LED
4	+12V

JUMPER TO FRONT CPU

2	KEY SCAN OUT 1
3	KEY SCAN OUT 2
4	KEY SCAN OUT 3
5	KEY SCAN IN 1
6	KEY SCAN IN 2
7	KEY SCAN IN 3
8	KEY SCAN IN 4

JUMPER TO FRONT CPU

1	LED ROW SCAN 1
2	LED ROW SCAN 2
3	LED ROW SCAN 3
4	LED ROW SCAN 4
5	LED COLUMN SCAN 1
6	LED COLUMN SCAN 2
7	LED COLUMN SCAN 3

P6210 TO AUDIO CONTROL P4108

1	———
2	———
3	———
4	+12V
5	Hi-Fi REC Ⓗ

P6212 TO LEFT CONTROL P6543-1,-2

1	———
2	———
3	CH1 Ⓛ
4	CH2 Ⓛ
5	+12V
6	+5V
7	GND
8	NR OUT Ⓗ
9	———
10	+5V (REMAINING POWER)
11	Hi-Fi MONITOR OFF Ⓛ
12	———

P6201 TO KEY BOARD

1	———
2	KEY SCAN OUT 1
3	KEY SCAN OUT 2
4	KEY SCAN OUT 3
5	KEY SCAN IN 1
6	KEY SCAN IN 2
7	KEY SCAN IN 3
8	KEY SCAN IN 4

P6202 TO KEY BOARD

1	LED ROW SCAN 1
2	LED ROW SCAN 2
3	LED ROW SCAN 3
4	LED ROW SCAN 4
5	LED COLUMN SCAN 1
6	LED COLUMN SCAN 2
7	LED COLUMN SCAN 3
8	———

P6205 TO COUNTER P6302

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	SERIAL CLOCK
4	SERIAL DATA
5	CTL PULSE
6	SUPPLY HALL IC
7	TAKE UP HALL IC
8	———

P6213 TO COUNTER P6301

1	25Hz Ⓗ
2	T160 Ⓛ
3	———
4	+5V (REMAINING POWER)
5	GND
6	FILAMENT
7	FILAMENT
8	−30V

P6204 TO SYSTEM CTL P6005

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	GND
4	SERIAL CLOCK
5	SERIAL DATA
6	POWER RESET
7	CTL PULSE
8	SUPPLY HALL IC
9	TAKE UP HALL IC
10	———

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

AUDIO CONTROL C.B.A. (VEP04098A1), Hi-Fi/NORMAL SELECT C.B.A. (VEP04097A) & LEFT CONTROL PANEL C.B. (VJB00B5

P4103 TO LEFT CONTROL PANEL P6546

1	CH1 METER ⊕
2	CH1 METER ⊖
3	NORMAL Ⓛ
4	CH2 METER ⊕
5	CH2 METER ⊖

P4109 TO COUNTER P6303, P6304

1	Hi-Fi MONITOR LED
2	MODE LOCK LED
3	REC ERROR LED
4	+12V
5	COUNTER RESET

P4102 TO Hi-Fi AUDIO OUT P6762

1	MUTE
2	―――

P4101 TO LEFT CONTROL PANEL P6544

1	CH 1 OUT
2	CH 2 OUT

P4108 TO Hi-Fi/NORMAL SELECT P4202, REAR JACK P6667, FRONT CPU P6210 LEFT CONTROL PANEL P6546

1	+12V
2	Hi-Fi MONITER Ⓛ
3	MODE LOCK Ⓗ
4	Hi-Fi REC SW
5	+12V
6	E-E ON/OFF MUTING

P4110 TO MECHA. CONN. P6707

1	RF OUT
2	GND
3	PG

P4106 TO SYSTEM CONTROL P6009 REAR JACK P6667

1	PLAY + 12V
2	R/P + 12V
3	E-E + 12V
4	GND
5	―――
6	REC REMOTE Ⓛ

P4107 TO Hi-Fi AUDIO P4306, P4307

1	+12V
2	+5V
3	MUTE
4	R/P + 12V
5	E-E + 12V
6	PLAY + 12V
7	H.SW
8	GND
9	―――
10	FM Ⓛ

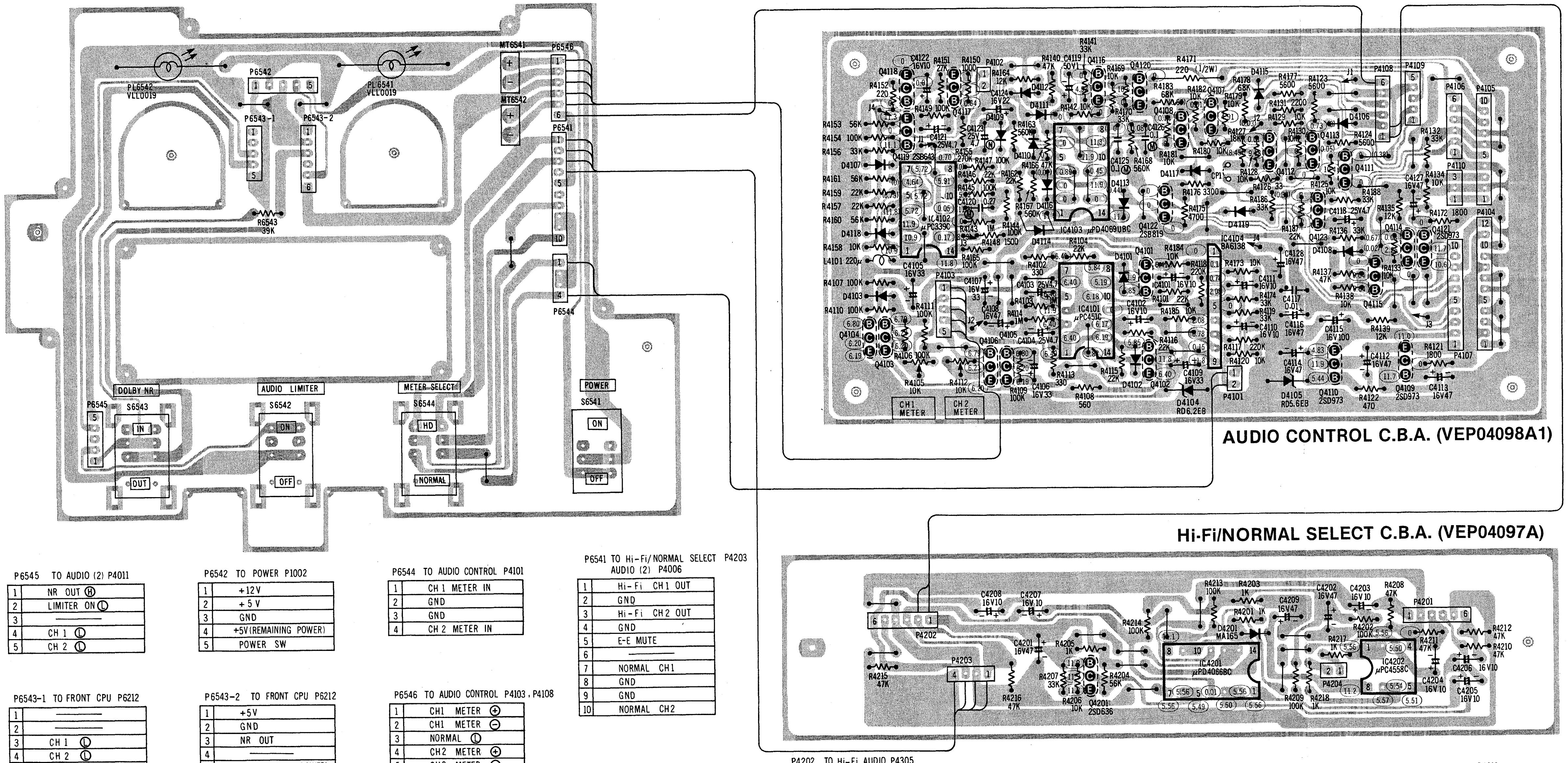
P4105 TO LUMINANCE & CHROMINANCE P3003, P3005 SERVO P2010

1	RF OUT
2	GND
3	PG
4	PLAY +12V
5	R/P +12V
6	E-E +12V
7	GND
8	―――
9	SS Ⓛ
10	―――

P4104 TO POWER P1003 AUDIO PRE AMP P4403 FAN MOTOR P6761

1	UNREG+20V
2	+12V
3	GND
4	UNREG+20V
5	+12V
6	GND
7	UNREG+20V
8	FAN +12V
9	GND
10	PLAY +12V
11	+12V
12	GND

LEFT CONTROL PANEL C.B. (VJB00B52)


PL6542 VLL0019
PL6541 VLL0019
P6542
P6543-1
P6543-2
R6543 39K
MT6541
MT6542
P6546
P6541
P6544
P6545
DOLBY NR
S6543
IN
OUT
AUDIO LIMITER
S6542
ON
OFF
METER SELECT
S6544
HD
NORMAL
POWER
S6541
ON
OFF
P4102
P4108
P4109
P4106
P4105
P4110
P4104
P4103
P4107
P4101
CH1 METER
CH2 METER
IC4101 μPC451C
IC4102 μPC339C
IC4103 μPD4069UBC
IC4104 BA6138
AUDIO CONTROL C.B.A. (VEP04098A1)
Hi-Fi/NORMAL SELECT C.B.A. (VEP04097A)
P4201
P4202
P4203
P4204
IC4201 μPD4066BC
IC4202 μPC4558C
D4201 MA165
Q4201 2SD636

P6545 TO AUDIO (2) P4011

1	NR OUT Ⓗ
2	LIMITER ON Ⓛ
3	―――
4	CH 1 Ⓛ
5	CH 2 Ⓛ

P6543-1 TO FRONT CPU P6212

1	―――
2	―――
3	CH 1 Ⓛ
4	CH 2 Ⓛ
5	+12V

P6542 TO POWER P1002

1	+12V
2	+5V
3	GND
4	+5V(REMAINING POWER)
5	POWER SW

P6543-2 TO FRONT CPU P6212

1	+5V
2	GND
3	NR OUT
4	―――
5	+5V(REMAINING POWER)
6	FM MONITOR OFF Ⓛ

P6544 TO AUDIO CONTROL P4101

1	CH 1 METER IN
2	GND
3	GND
4	CH 2 METER IN

P6546 TO AUDIO CONTROL P4103, P4108

1	CH1 METER ⊕
2	CH1 METER ⊖
3	NORMAL Ⓛ
4	CH2 METER ⊕
5	CH2 METER ⊖
6	Hi-Fi MUTE

P6541 TO Hi-Fi/NORMAL SELECT P4203 AUDIO (2) P4006

1	Hi-Fi CH1 OUT
2	GND
3	Hi-Fi CH2 OUT
4	GND
5	E-E MUTE
6	―――
7	NORMAL CH1
8	GND
9	GND
10	NORMAL CH2

P4202 TO Hi-Fi AUDIO P4305 AUDIO CONTROL P4108

1	+12V
2	Hi-Fi MONITOR Ⓛ
3	Hi-Fi CH1 OUT
4	GND
5	GND
6	Hi-Fi CH2 OUT

P4203 TO LEFT CONTRO PANEL P6541

1	Hi-Fi CH1 OUT
2	GND
3	Hi-Fi CH2 OUT
4	GND

P4204 TO AUDIO (2)

1	CH 1 LINE OUT
2	CH 2 LINE OUT

P4201 TO AUDIO (2) P4015, P4016

1	NORMAL CH1 IN
2	GND
3	CH1 OUT
4	NORMAL CH2 IN
5	GND
6	CH2 OUT

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165.
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

IAL SELECT C.B.A. (VEP04097A) & LEFT CONTROL PANEL C.B. (VJB00B52)

P4101 TO LEFT CONTROL PANEL P6544

1	CH 1 OUT
2	CH 2 OUT

P4110 TO MECHA. CONN. P6707

1	RF OUT
2	GND
3	PG

P4107 TO Hi-Fi AUDIO P4306, P4307

1	+12V
2	+5V
3	MUTE
4	R/P + 12V
5	E-E + 12V
6	PLAY + 12V
7	H.SW
8	GND
9	———
10	FM Ⓛ

P4105 TO LUMINANCE & CHROMINANCE P3003, P3005 SERVO P2010

1	RF OUT
2	GND
3	PG
4	PLAY +12V
5	R/P +12V
6	E-E +12V
7	GND
8	———
9	SS Ⓛ
10	———

P4104 TO POWER P1003
AUDIO PRE AMP P4403
FAN MOTOR P6761

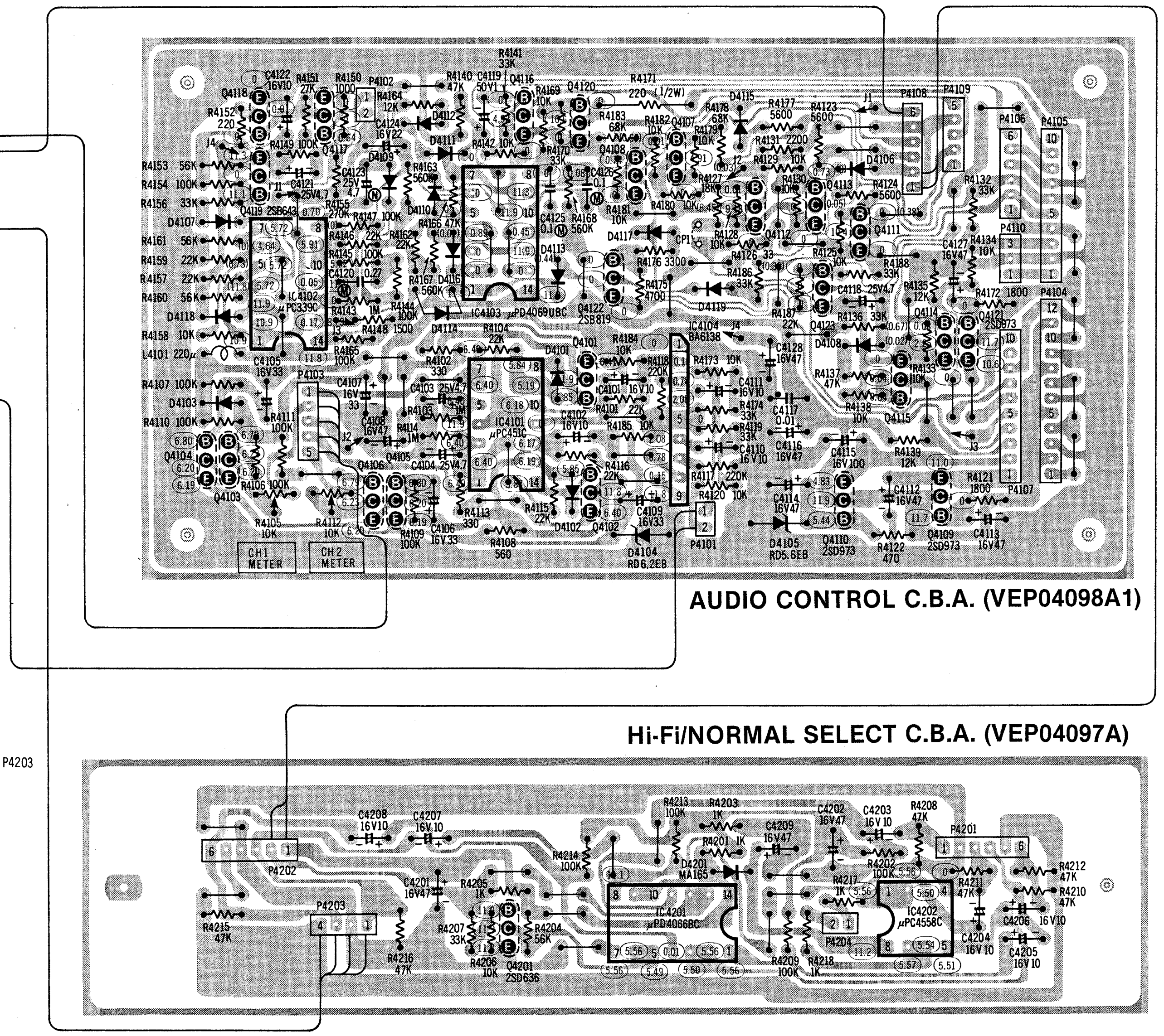
1	UNREG+20V
2	+12V
3	GND
4	UNREG+20V
5	+12V
6	GND
7	UNREG +20V
8	FAN +12V
9	GND
10	PLAY +12V
11	+12V
12	GND

P4108 TO Hi-Fi/NORMAL SELECT P4202, REAR JACK P6667, FRONT CPU P6210 LEFT CONTROL PANEL P6546

1	+12V
2	Hi-Fi MONITER Ⓛ
3	MODE LOCK Ⓗ
4	Hi-Fi REC SW
5	+12V
6	E-E ON/OFF MUTING

P4106 TO SYSTEM CONTROL P6009 REAR JACK P6667

1	PLAY + 12V
2	R/P + 12V
3	E-E + 12V
4	GND
5	———
6	REC REMOTE Ⓛ



AUDIO CONTROL C.B.A. (VEP04098A1)

Hi-Fi/NORMAL SELECT C.B.A. (VEP04097A)

i- |ORMAL SELECT P4203
D (|P4006

Fi CH1 OUT
D
Fi H2 OUT
D
M
RMAL CH1
D
D
RM/ CH2

P4202 TO Hi-Fi AUDIO P4305 AUDIO CONTROL P4108

1	+12V
2	Hi-Fi MONITOR Ⓛ
3	Hi-Fi CH1 OUT
4	GND
5	GND
6	Hi-Fi CH2 OUT

P4203 TO LEFT CONTRO PANEL P6541

1	Hi-Fi CH1 OUT
2	GND
3	Hi-Fi CH2 OUT
4	GND

P4204 TO AUDIO (2)

1	CH 1 LINE OUT
2	CH 2 LINE OUT

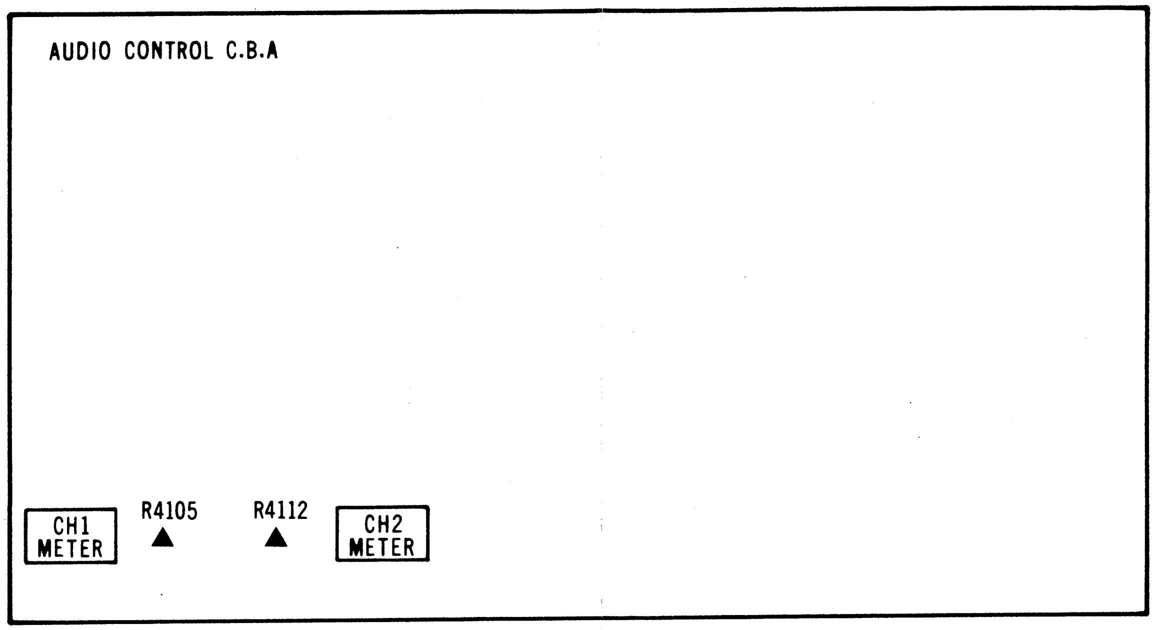
P4201 TO AUDIO (2) P4015, P4016

1	NORMAL CH1 IN
2	GND
3	CH1 OUT
4	NORMAL CH2 IN
5	GND
6	CH2 OUT

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165.
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

The DC voltages in this diagram are measured in PLAY and RECORD mode. (The voltages indicated in brackets (   ) are measured in RECORD mode.)

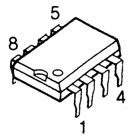
5 6 7 8



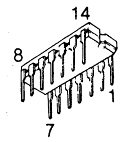
Audio Control C.B.A. (VEP04098A1)	
Q4101	C-6
Q4102	C-6
Q4103	C-5
Q4104	C-5
Q4105	C-6
Q4106	C-6
Q4107	D-7
Q4108	D-6
Q4109	C-7
Q4110	C-7
Q4111	D-7
Q4112	D-7
Q4113	D-7
Q4114	D-7
Q4115	C-7
Q4116	D-6
Q4117	D-5
Q4118	D-5
Q4119	D-5
Q4120	D-6
Q4121	D-8
Q4122	D-6
Q4123	D-7
IC4101	C-6
IC4102	D-5
IC4103	D-6
IC4104	C-7

Hi-Fi/Normal Select C.B.A. (VEP04097A)	
Q4201	B-6
IC4201	B-7
IC4202	B-7

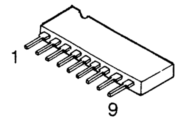
Audio Control & Hi-Fi/Normal Select C.B.A. ICs & Transistors Information



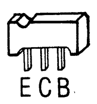
μPC4558C



μPC339C
μPC451C
μPD4066BC
μPD4069UBC



BA6138



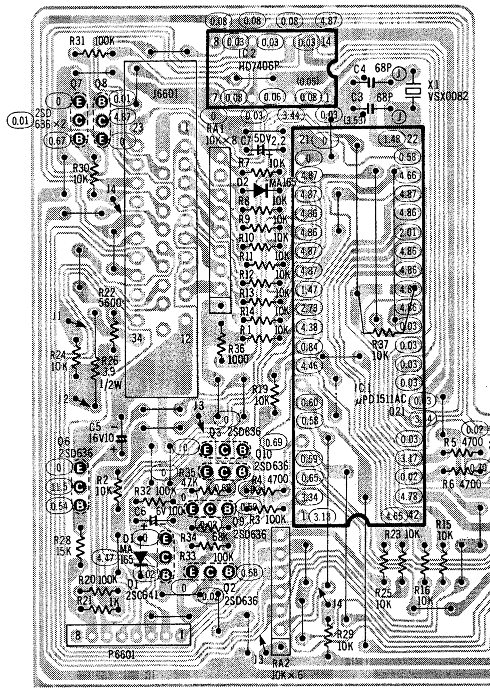
2SB643
2SB819
2SD636
2SD973

34P CONTROL C.B.A. (VEP00982A), REAR JACK C.B.A. (VEP00B58A), AUDIO VR C.B. (VJB00B53) & AUDIO PRE-AMP C.B.A. (VEP40

J6601 34P CONNECTOR

1	REC SW	18	CONTROL PULSE OUT
2	PLAY SW	19	REMOTE 19
3	FF SW	20	START MARK
4	REW SW	21	EJECT SW
5	STOP SW	22	——
6	AUDIO DUB SW	23	REC HOLD
7	PAUSE SW	24	PLAY HOLD
8	CASSETTE IN	25	FF HOLD
9	CUT IN SW	26	REW HOLD
10	FF. REW SLOW DOWN	27	——
11	——	28	AUDIO DUB HOLD
12	GND	29	PAUSE HOLD
13	STEP SW	30	REMOTE 30
14	REVERSE COUNT	31	CUT IN HOLD
15	——	32	——
16	——	33	REMOTE 33
17	REVERSE IN	34	+12V

34P CONTROL C.B.A. (VEP00982A)



IC1
μPD1511AC
IC2
HD7406P
X1
VSX0082
J6601
P6601
P6602
RA1
RA2
10K×6
2SD636
2SC641
R31 100K
R36 1000
R37 10K
R19 10K
VJB00982

REF. NO. 6600 SERIES.

P6602 TO REAR JACK P6661

1	PG 2
2	PG 3
3	PH 0
4	PH 1
5	PH 2
6	PH 3
7	SW SCAN A1 IN
8	SW SCAN C2 IN
9	EJECT SW
10	+12V
11	+5V
12	GND

P6601 TO SYSTEM CONTROL P6006

1	$\overline{\text{IRQ}}$
2	$\overline{\text{ADDRESS}}$
3	GND
4	SERIAL CLOCK
5	SERIAL DATA
6	POWER RESET
7	CTL PULSE
8	——

P6661 TO 34P CONTROL P6602

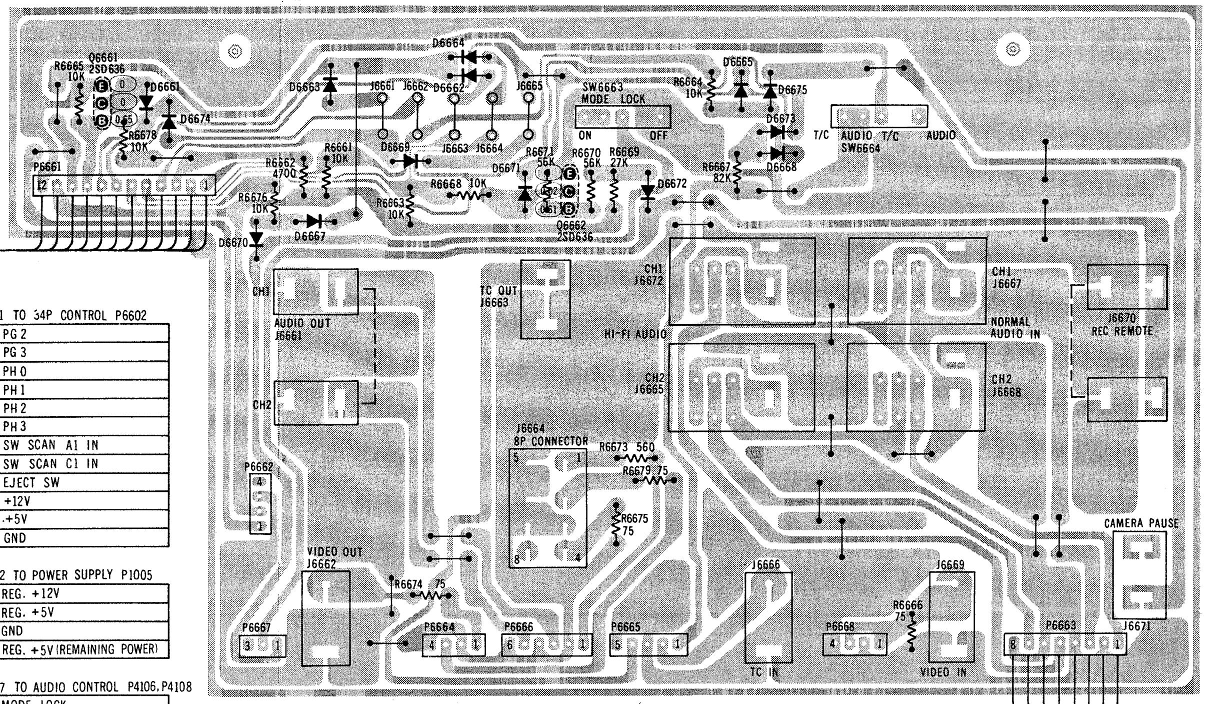
1	PG 2
2	PG 3
3	PH 0
4	PH 1
5	PH 2
6	PH 3
7	SW SCAN A1 IN
8	SW SCAN C1 IN
9	EJECT SW
10	+12V
11	+5V
12	GND

P6662 TO POWER SUPPLY P1005

1	REG. +12V
2	REG. +5V
3	GND
4	REG. +5V (REMAINING POWER)

P6667 TO AUDIO CONTROL P4106, P4108

1	MODE LOCK
2	REMOTE REC Ⓛ
3	——



SW6663
MODE LOCK
ON
OFF
SW6664
T/C AUDIO T/C AUDIO
Q6661 2SD636
Q6662 2SD636
P6661
P6662
P6664
P6665
P6666
P6667
P6668
P6663
CH1 AUDIO OUT J6661
CH2
TC OUT J6663
HI-FI AUDIO
CH1 J6672
CH2 J6665
CH1 J6667 NORMAL AUDIO IN
CH2 J6668
J6670 REC REMOTE
J6664 8P CONNECTOR
VIDEO OUT J6662
J6666 TC IN
J6669 VIDEO IN
CAMERA PAUSE
J6671

REAR JACK C.B.A. (VEP00B58A)

P6663 TO AUDIO PRE AMP P4401

1	NORMAL
2	GND
3	NORMAL
4	GND
5	Hi-Fi CH1 IN
6	GND
7	Hi-Fi CH2 IN
8	GND

P6668 TO LUMINANCE & CHROMINANCE P3006

1	VIDEO IN
2	GND
3	VIDEO IN
4	GND

P6665 TO AUDIO (2) P4014

1	T.C ON +12V
2	T.C IN
3	GND
4	T.C OUT
5	GND

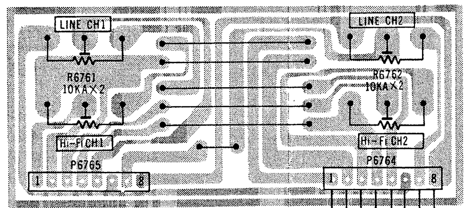
P6666 TO AUDIO (2) P4010

1	AUDIO 8P OUT
2	GND
3	CH1 LINE OUT
4	GND
5	CH2 LINE OUT
6	GND

P6664 TO LUMINANCE & CHROMINANCE P3004

1	VIDEO OUT LINE
2	GND
3	VIDEO OUT 8P
4	GND

AUDIO VR C.B. (VJB00B53)



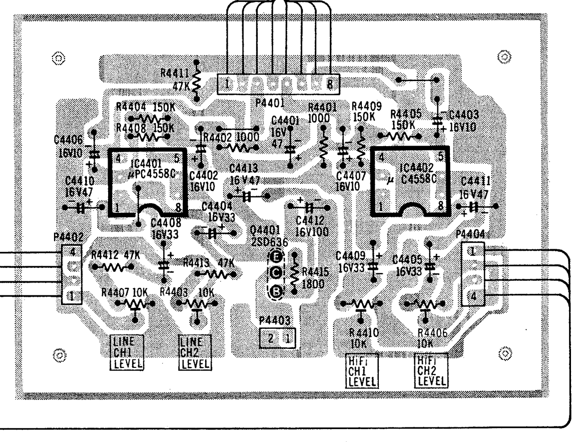
LINE CH1
LINE CH2
R6761 10K×2
R6762 10K×2
Hi-Fi CH1
Hi-Fi CH2
P6765
P6764

TO AUDIO (1) P4001,
P6765 HiFi AUDIO P6705

1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND
5	HiFi CH1 IN
6	GND
7	HiFi CH2 IN
8	GND

P6764 TO AUDIO PREAMP P4402, 4404

1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND
5	HiFi CH1 IN
6	GND
7	HiFi CH2 IN
8	GND



P4401
P4402
P4403
P4404
IC4401 μPC4558C
IC4402 C4558C
Q4401 2SD636
LINE CH1 LEVEL
LINE CH2 LEVEL
HiFi CH1 LEVEL
HiFi CH2 LEVEL

AUDIO PRE-AMP C.B.A. (VEP04099A1)

P4401 TO REAR JACK P6663

1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND
5	Hi-Fi CH1 IN
6	GND
7	Hi-Fi CH2 IN
8	GND

P4404 TO AUDIO VR P6764

1	HiFi CH1 IN
2	GND
3	HiFi CH2 IN
4	GND

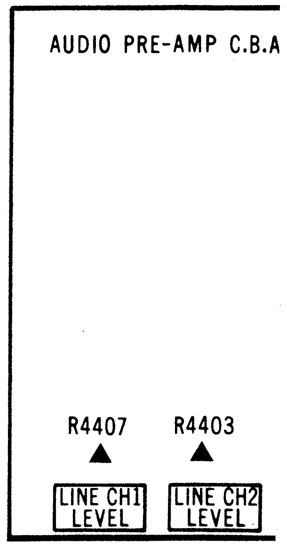
P4402 TO AUDIO VR P6764

1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND

P4403 TO AUDIO CONTROL P4104

1	+12V
2	GND

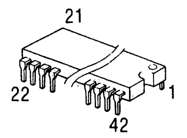
The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)



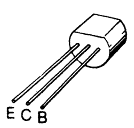
AUDIO PRE-AMP C.B.A
R4407
R4403
LINE CH1 LEVEL
LINE CH2 LEVEL

34P Control C.B (VEP00982A)
Q6601
Q6602
Q6603
Q6604
Q6605
Q6606
Q6607
Q6608
Q6609
Q6610
IC6601
IC6602

34P Control, R
ICs & Transisto

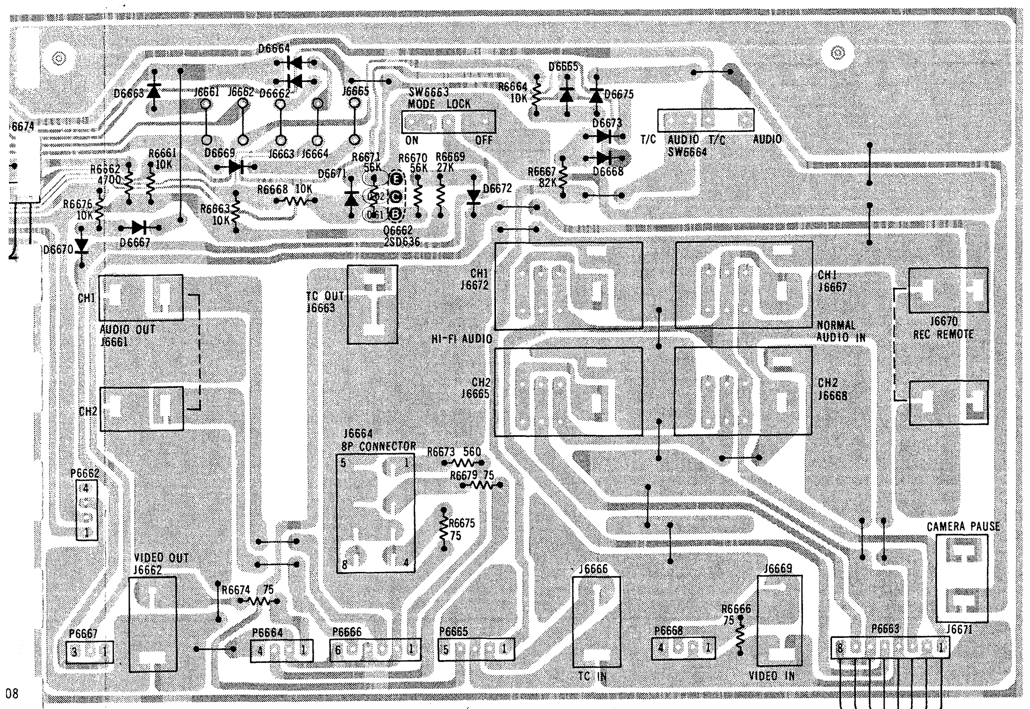


μPD1511AC



2SC641

. (VEP00B58A), AUDIO VR C.B. (VJB00B53) & AUDIO PRE-AMP C.B.A. (VEP4099A1)


D6664
D6665
D6675
D6673
D6668
D6672
D6669
D6671
D6667
D6670
SW6663
MODE LOCK
ON
OFF
T/C AUDIO T/C AUDIO
SW6664
Q6662
2SD636
CH1
AUDIO OUT
J6661
CH2
TC OUT
J6663
Hi-Fi AUDIO
CH1
J6672
CH2
J6665
CH1
J6667
NORMAL
AUDIO IN
CH2
J6668
J6670
REC REMOTE
J6664
8P CONNECTOR
CAMERA PAUSE
VIDEO OUT
J6662
J6666
J6669
TC IN
VIDEO IN
P6662
P6667
P6664
P6666
P6665
P6668
P6663
J6671

REAR JACK C.B.A. (VEP00B58A)

P6663 TO AUDIO PRE AMP P4401

1	NORMAL
2	GND
3	NORMAL
4	GND
5	Hi-Fi CH1 IN
6	GND
7	Hi-Fi CH2 IN
8	GND

P6668 TO LUMINANCE & CHROMINANCE P3006

1	VIDEO IN
2	GND
3	VIDEO IN
4	GND

P6665 TO AUDIO (2) P4014

1	T.C ON +12V
2	T.C IN
3	GND
4	T.C OUT
5	GND

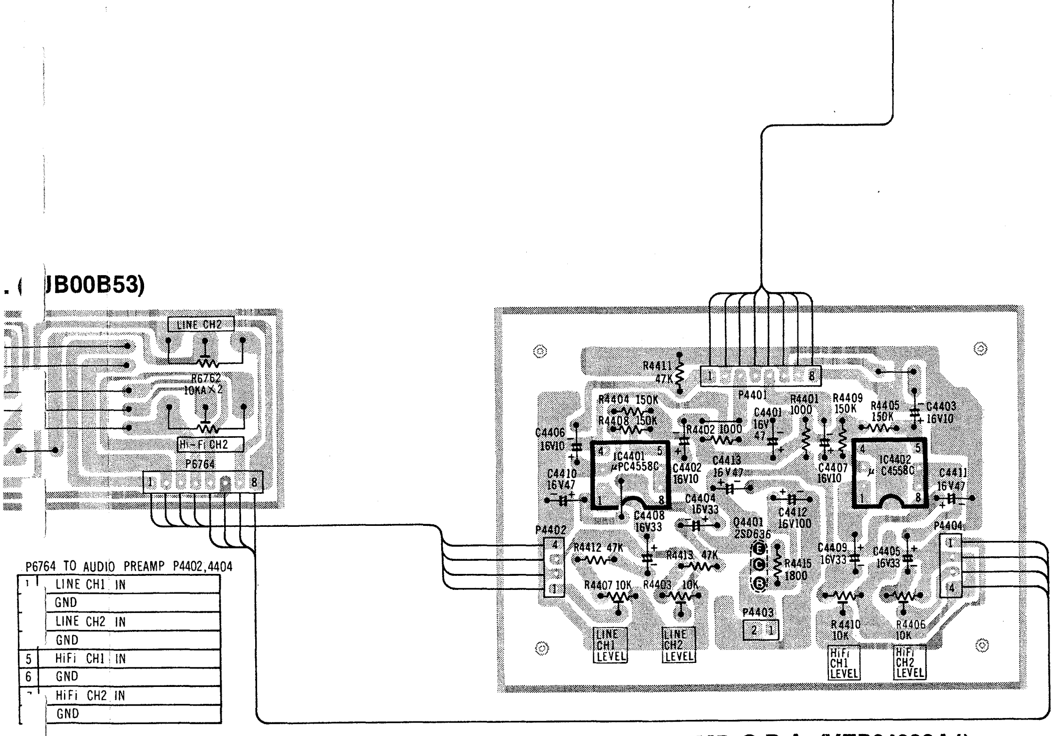
P6666 TO AUDIO (2) P4010

1	AUDIO 8P OUT
2	GND
3	CH1 LINE OUT
4	GND
5	CH2 LINE OUT
6	GND

P6664 TO LUMINANCE & CHROMINANCE P3004

1	VIDEO OUT LINE
2	GND
3	VIDEO OUT 8P
4	GND

. (JB00B53)


LINE CH2
R6762
10KA×2
Hi-Fi CH2
P6764
R4411
47K
P4401
R4404 150K
R4408 150K
C4401 1000
R4401
R4409 150K
R4405 150K
C4403 16V10
C4406 16V10
R4402 1000
IC4401
μPC4558C
IC4402
μPC4558C
C4410 16V47
C4402 16V10
C4413 16V47
C4407 16V10
C4411 16V47
C4404 16V33
C4408 16V33
Q4401
2SD636
C4412 16V100
P4402
P4404
R4412 47K
R4413 47K
C4409 16V33
C4405 16V33
R4415 1800
R4407 10K
R4403 10K
P4403
R4410 10K
R4406 10K
LINE CH1 LEVEL
LINE CH2 LEVEL
HiFi CH1 LEVEL
HiFi CH2 LEVEL

P6764 TO AUDIO PREAMP P4402,4404

1	LINE CH1 IN
	GND
	LINE CH2 IN
	GND
5	HiFi CH1 IN
6	GND
	HiFi CH2 IN
	GND

AUDIO PRE-AMP C.B.A. (VEP04099A1)

P4401 TO REAR JACK P6663

1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND
5	Hi-Fi CH1 IN
6	GND
7	Hi-Fi CH2 IN
8	GND

P4404 TO AUDIO VR P6764

1	HiFi CH1 IN
2	GND
3	HiFi CH2 IN
4	GND

P4402 TO AUDIO VR P6764

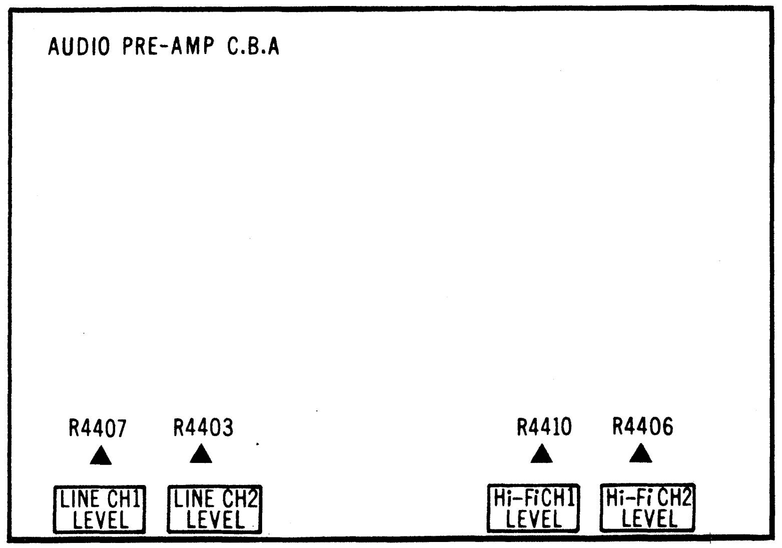
1	LINE CH1 IN
2	GND
3	LINE CH2 IN
4	GND

P4403 TO AUDIO CONTROL P4104

1	+12V
2	GND

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

5 6 7 8 9

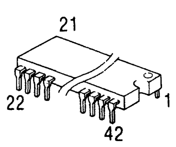

AUDIO PRE-AMP C.B.A
R4407
R4403
R4410
R4406
LINE CH1 LEVEL
LINE CH2 LEVEL
Hi-Fi CH1 LEVEL
Hi-Fi CH2 LEVEL

34P Control C.B.A. (VEP00982A)	
Q6601	B-1
Q6602	B-2
Q6603	B-2
Q6604	B-3
Q6605	B-3
Q6606	B-1
Q6607	D-1
Q6608	D-1
Q6609	B-2
Q6610	B-2
IC6601	C-2
IC6602	D-2

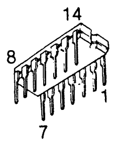
Rear Jack C.B.A. (VEP00B58A)	
Q6661	F-4
Q6662	E-6

Audio Pre-Amp C.B.A. (VEP4099A1)	
Q4401	A-7
IC4401	B-7
IC4402	B-8

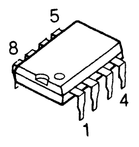
34P Control, Rear Jack & Audio Pre-Amp C.B.A. ICs & Transistors Information



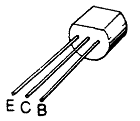
μPD1511AC



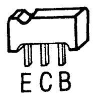
HD7406P



μPC4558C



2SC641



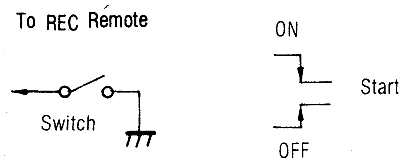
2SD636

INFORMATION ON AVAILABLE FUNCTIONS

In order to extend the user's applications, the following functions can be achieved by disconnecting the jumper resistors.

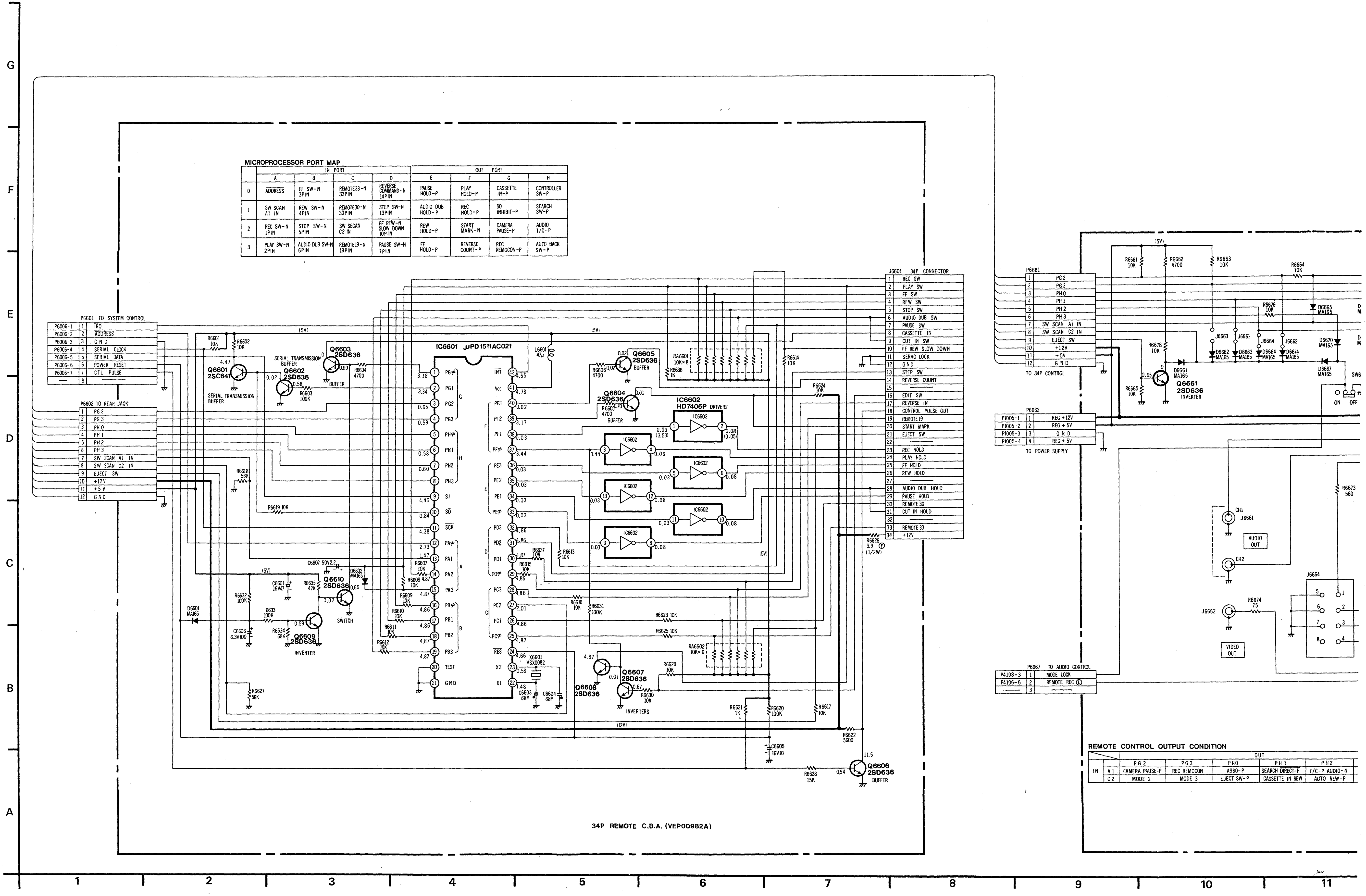
1. Remove jumper resistor W6601 on the Rear Jack P. C. Board so that the unit will rewind the tape to the beginning.
2. Remove jumper resistor W6604 on the Rear Jack P. C. Board so that the unit will stop when the end of the tape is reached. (Auto Rewind Cancel)
3. Remove jumper resistor W6605 on the Rear Jack P. C. Board so that the unit will perform the direct search operation.
   (This function is identical to the NV-8500 search dial function.)
4. Record Remote Connector (REC REMOTE) used for remote control and connect to the ON/OFF remote control unit or the Record Remote Connector of another AG-6800. Record Remote Connector in the Record mode.
   The following functions are available when the Remote switch is in the OFF position, which is a Low to High transition.

   Jumper resistors W6603 and W6602 are located on the Rear Jack P.C.Board.


To REC Remote
Switch
ON
Start
OFF

	W6603	W6602	
1	Remove	Remove	PAUSE mode
2	Remove	Short	EJECT mode
3	Short	Remove	REWIND is Performed first, followed by EJECT.
4	Short	Short	STOP mode

34P CONTROL, REAR JACK, AUDIO VR & AUDIO PRE-AMP SCHEMATIC DIAGRAM

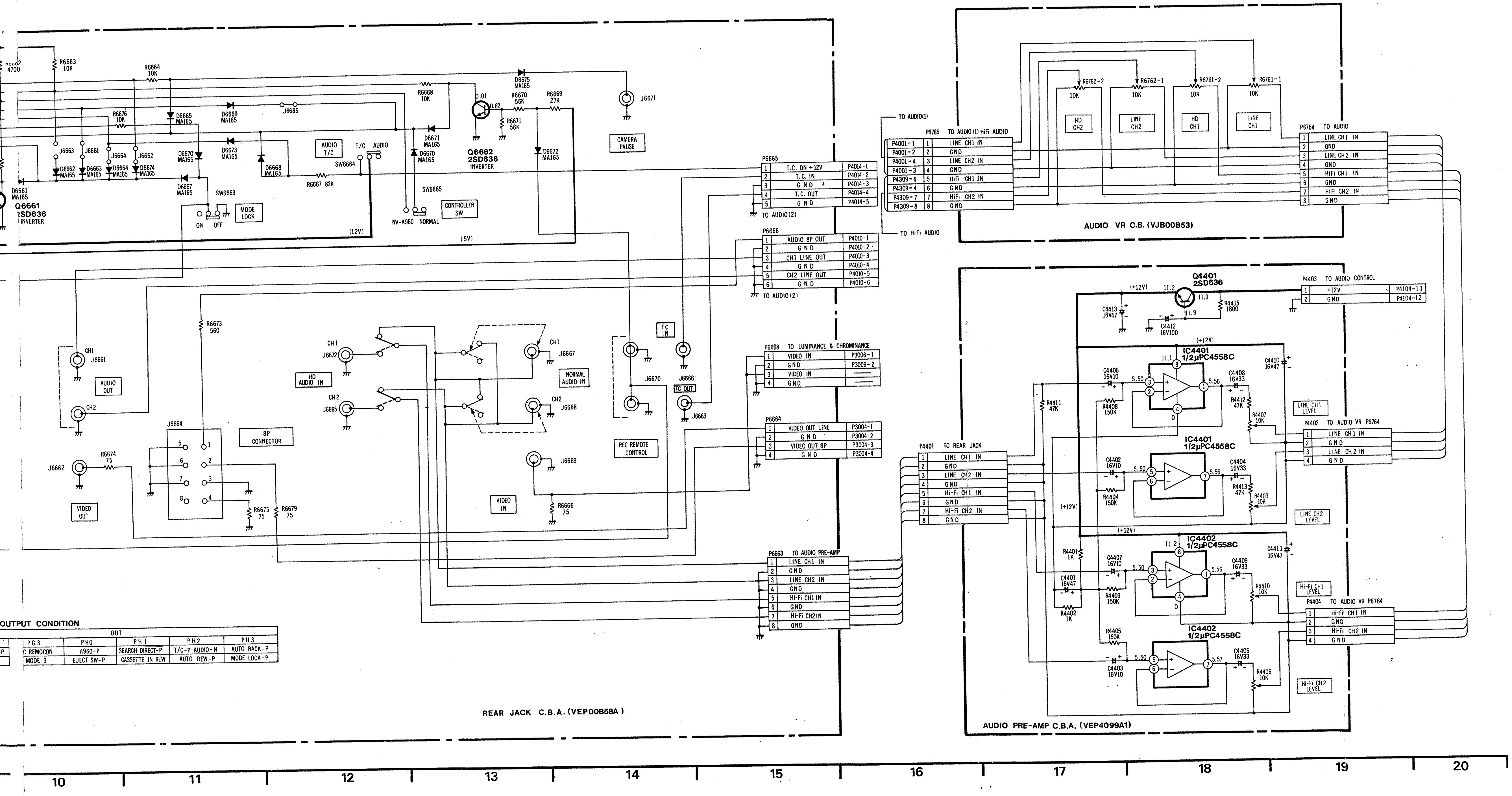

G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
P6601 TO SYSTEM CONTROL
P6006-1 1 IRQ
P6006-2 2 ADDRESS
P6006-3 3 G N D
P6006-4 4 SERIAL CLOCK
P6006-5 5 SERIAL DATA
P6006-6 6 POWER RESET
P6006-7 7 CTL PULSE
— 8 —
P6602 TO REAR JACK
1 PG 2
2 PG 3
3 PH 0
4 PH 1
5 PH 2
6 PH 3
7 SW SCAN A1 IN
8 SW SCAN C2 IN
9 EJECT SW
10 +12 V
11 +5 V
12 G N D
Q6601 2SC641
SERIAL TRANSMISSION BUFFER
Q6602 2SD636
SERIAL TRANSMISSION BUFFER
Q6603 2SD636
BUFFER
R6601 10K
R6602 10K
R6603 100K
R6604 4700
R6618 56K
R6619 10K
(5V)
C6607 50V2.2
D6602 MA165
Q6610 2SD636
SWITCH
C6601 16V47
R6635 47K
R6632 100K
R6633 100K
D6601 MA165
C6606 6.3V100
R6634 68K
Q6609 2SD636
INVERTER
R6627 56K
IC6601 μPD1511AC021
1 PGφ 3.18
2 PG1 3.34
3 PG2 0.65
4 PG3 0.59
5 PHφ
6 PH1 0.58
7 PH2 0.60
8 PH3
9 SI 4.46
10 SO 0.84
11 SCK 4.38
12 PAφ 2.73
13 PA1 1.47
14 PA2 4.87
15 PA3 4.87
16 PBφ 4.86
17 PB1 4.86
18 PB2 4.87
19 PB3 4.87
20 TEST
21 GND
42 INT 4.65
41 Vcc 4.78
40 PF3 0.02
39 PF2 3.17
38 PF1 0.03
37 PFφ 3.44
36 PE3 0.03
35 PE2 0.03
34 PE1 0.03
33 PEφ 0.03
32 PD3 4.86
31 PD2 4.86
30 PD1 4.87
29 PDφ 4.86
28 PC3 4.86
27 PC2 2.01
26 PC1 4.86
25 PCφ 4.87
24 RES 4.66
23 X2 0.58
22 X1 1.48
G
H
A
B
F
E
D
C
R6607 10K
R6608 10K
R6609 10K
R6610 10K
R6611 10K
R6612 10K
L6601 47μ
X6601 VSX0082
C6603 68P
C6604 68P
R6637 10K
R6615 10K
R6613 10K
R6616 10K
R6631 100K
Q6605 2SD636
BUFFER
R6605 4700
R6606 4700
Q6604 2SD636
BUFFER
R6636 1K
RA6601 10K×8
R6614 10K
IC6602 HD7406P DRIVERS
IC6602
R6624 10K
R6623 10K
R6625 10K
RA6602 10K×6
Q6608 2SD636
Q6607 2SD636
INVERTERS
R6629 10K
R6630 10K
R6621 1K
R6620 100K
R6617 10K
R6622 5600
C6605 16V10
R6628 15K
Q6606 2SD636
BUFFER
(12V)
J6601 34P CONNECTOR
1 REC SW
2 PLAY SW
3 FF SW
4 REW SW
5 STOP SW
6 AUDIO DUB SW
7 PAUSE SW
8 CASSETTE IN
9 CUT IN SW
10 FF REW SLOW DOWN
11 SERVO LOCK
12 GND
13 STEP SW
14 REVERSE COUNT
15 —
16 EDIT SW
17 REVERSE IN
18 CONTROL PULSE OUT
19 REMOTE 19
20 START MARK
21 EJECT SW
22 —
23 REC HOLD
24 PLAY HOLD
25 FF HOLD
26 REW HOLD
27 —
28 AUDIO DUB HOLD
29 PAUSE HOLD
30 REMOTE 30
31 CUT IN HOLD
32 —
33 REMOTE 33
34 +12V
R6626 3.9 Ⓕ (1/2W)
34P REMOTE C.B.A. (VEP00982A)
P6661
1 PG 2
2 PG 3
3 PH 0
4 PH 1
5 PH 2
6 PH 3
7 SW SCAN A1 IN
8 SW SCAN C2 IN
9 EJECT SW
10 +12V
11 +5V
12 G N D
TO 34P CONTROL
P6662
P1005-1 1 REG +12V
P1005-2 2 REG +5V
P1005-3 3 G N D
P1005-4 4 REG +5V
TO POWER SUPPLY
(5V)
R6661 10K
R6662 4700
R6663 10K
R6664 10K
R6676 10K
R6678 10K
R6665 10K
Q6661 2SD636
INVERTER
D6661 MA165
J6663
J6661
J6664
J6662
D6662 MA165
D6663 MA165
D6664 MA165
D6674 MA165
D6665 MA165
D6670 MA165
D6667 MA165
ON
OFF
R6673 560
CH1
J6661
AUDIO OUT
CH2
J6664
R6674 75
J6662
VIDEO OUT
P6667 TO AUDIO CONTROL
P4108-3 1 MODE LOCK
P4106-6 2 REMOTE REC ①
— 3

MICROPROCESSOR PORT MAP

	IN PORT				OUT PORT			
	A	B	C	D	E	F	G	H
0	ADDRESS	FF SW-N 3PIN	REMOTE33-N 33PIN	REVERSE COMMAND-N 14PIN	PAUSE HOLD-P	PLAY HOLD-P	CASSETTE IN-P	CONTROLLER SW-P
1	SW SCAN A1 IN	REW SW-N 4PIN	REMOTE30-N 30PIN	STEP SW-N 13PIN	AUDIO DUB HOLD-P	REC HOLD-P	SO INHIBIT-P	SEARCH SW-P
2	REC SW-N 1PIN	STOP SW-N 5PIN	SW SECAN C2 IN	FF REW-N SLOW DOWN 10PIN	REW HOLD-P	START MARK-N	CAMERA PAUSE-P	AUDIO T/C-P
3	PLAY SW-N 2PIN	AUDIO DUB SW-N 6PIN	REMOTE19-N 19PIN	PAUSE SW-N 7PIN	FF HOLD-P	REVERSE COUNT-P	REC REMOCON-P	AUTO BACK SW-P

REMOTE CONTROL OUTPUT CONDITION

		OUT				
		PG 2	PG 3	PH0	PH 1	PH2
IN	A 1	CAMERA PAUSE-P	REC REMOCON	A960-P	SEARCH DIRECT-P	T/C-P AUDIO-N
	C 2	MODE 2	MODE 3	EJECT SW-P	CASSETTE IN REW	AUTO REW-P

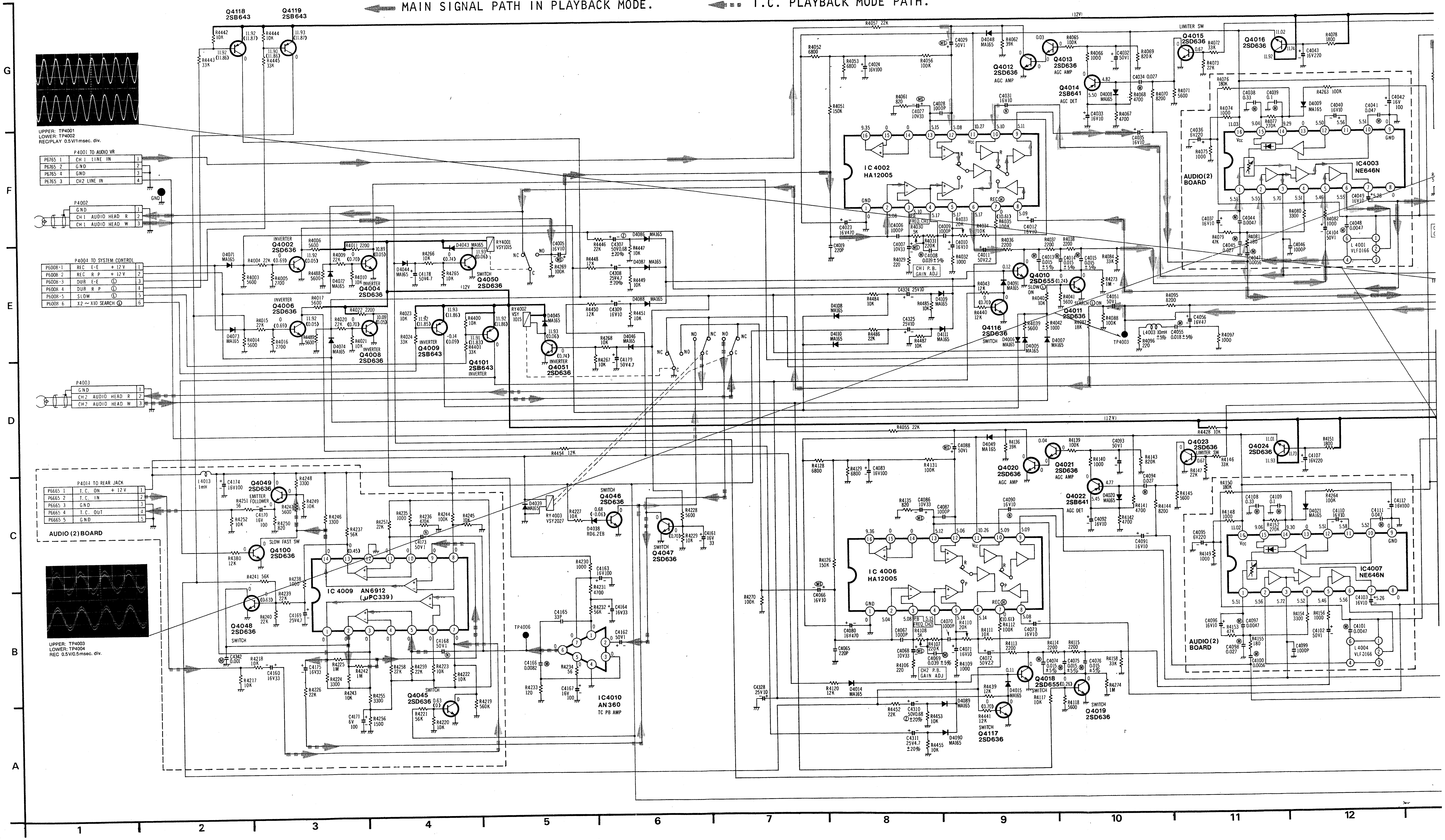

R6662 4700
R6663 10K
R6664 10K
R6676 10K
R6668 10K
R6670 56K
R6669 27K
R6671 56K
R6667 82K
D6675 MA165
D6665 MA165
D6669 MA165
D6671 MA165
D6670 MA165
D6673 MA165
D6668 MA165
D6672 MA165
D6667 MA165
D6661 MA165
D6662 MA165
D6663 MA165
D6664 MA165
D6674 MA165
J6663
J6661
J6664
J6662
J6665
J6671
Q6661 2SD636 INVERTER
Q6662 2SD636 INVERTER
0.01
0.62
AUDIO T/C
T/C AUDIO
SW6664
SW6663
ON OFF
MODE LOCK
SW6665
NV-A960 NORMAL
CONTROLLER SW
CAMERA PAUSE
(12V)
(5V)
P6665
1 T.C. ON +12V P4014-1
2 T.C. IN P4014-2
3 GND 4 P4014-3
4 T.C. OUT P4014-4
5 GND P4014-5
TO AUDIO(2)
P6666
1 AUDIO 8P OUT P4010-1
2 GND P4010-2
3 CH1 LINE OUT P4010-3
4 GND P4010-4
5 CH2 LINE OUT P4010-5
6 GND P4010-6
TO AUDIO(2)
P6668 TO LUMINANCE & CHROMINANCE
1 VIDEO IN P3006-1
2 GND P3006-2
3 VIDEO IN
4 GND
P6664
1 VIDEO OUT LINE P3004-1
2 GND P3004-2
3 VIDEO OUT 8P P3004-3
4 GND P3004-4
P6663 TO AUDIO PRE-AMP
1 LINE CH1 IN
2 GND
3 LINE CH2 IN
4 GND
5 Hi-Fi CH1 IN
6 GND
7 Hi-Fi CH2IN
8 GND
CH1 J6661
CH2
AUDIO OUT
J6662
R6674 75
VIDEO OUT
J6664
8P CONNECTOR
R6673 560
R6675 75
R6679 75
CH1 J6672
CH2 J6665
HD AUDIO IN
CH1 J6667
CH2 J6668
NORMAL AUDIO IN
J6669
VIDEO IN
R6666 75
TC IN
J6670
J6666
TC OUT
J6663
REC REMOTE CONTROL
REAR JACK C.B.A. (VEP00B58A)
TO AUDIO(1)
P6765 TO AUDIO (1) HiFi AUDIO
P4001-1 1 LINE CH1 IN
P4001-2 2 GND
P4001-4 3 LINE CH2 IN
P4001-3 4 GND
P4309-6 5 HiFi CH1 IN
P4309-4 6 GND
P4309-7 7 HiFi CH2 IN
P4309-8 8 GND
TO HiFi AUDIO
R6762-2 10K
R6762-1 10K
R6761-2 10K
R6761-1 10K
HD CH2
LINE CH2
HD CH1
LINE CH1
P6764 TO AUDIO
1 LINE CH1 IN
2 GND
3 LINE CH2 IN
4 GND
5 HiFi CH1 IN
6 GND
7 HiFi CH2 IN
8 GND
AUDIO VR C.B. (VJB00B53)
Q4401 2SD636
(+12V)
11.2
11.9
C4413 16V47
C4412 16V100
R4415 1800
P4403 TO AUDIO CONTROL
1 +12V P4104-11
2 GND P4104-12
IC4401 1/2μPC4558C
IC4402 1/2μPC4558C
11.1
5.50
5.56
5.57
0
C4406 16V10
C4408 16V33
C4410 16V47
C4402 16V10
C4404 16V33
C4407 16V10
C4409 16V33
C4411 16V47
C4401 16V47
C4403 16V10
C4405 16V33
R4411 47K
R4408 150K
R4412 47K
R4407 10K
R4404 150K
R4413 47K
R4403 10K
R4401 1K
R4402 1K
R4409 150K
R4410 10K
R4405 150K
R4406 10K
LINE CH1 LEVEL
LINE CH2 LEVEL
Hi-Fi CH1 LEVEL
Hi-Fi CH2 LEVEL
P4402 TO AUDIO VR P6764
1 LINE CH1 IN
2 GND
3 LINE CH2 IN
4 GND
P4404 TO AUDIO VR P6764
1 Hi-Fi CH1 IN
2 GND
3 Hi-Fi CH2 IN
4 GND
P4401 TO REAR JACK
1 LINE CH1 IN
2 GND
3 LINE CH2 IN
4 GND
5 Hi-Fi CH1 IN
6 GND
7 Hi-Fi CH2 IN
8 GND
AUDIO PRE-AMP C.B.A. (VEP4099A1)
10
11
12
13
14
15
16
17
18
19
20

OUTPUT CONDITION

	OUT				
	PG3	PH0	PH1	PH2	PH3
P	C REMOCON	A960-P	SEARCH $\overline{\text{DIRECT}}$-P	T/C-P AUDIO-N	AUTO BACK-P
	MODE 3	EJECT SW-P	CASSETTE IN REW	AUTO REW-P	MODE LOCK-P

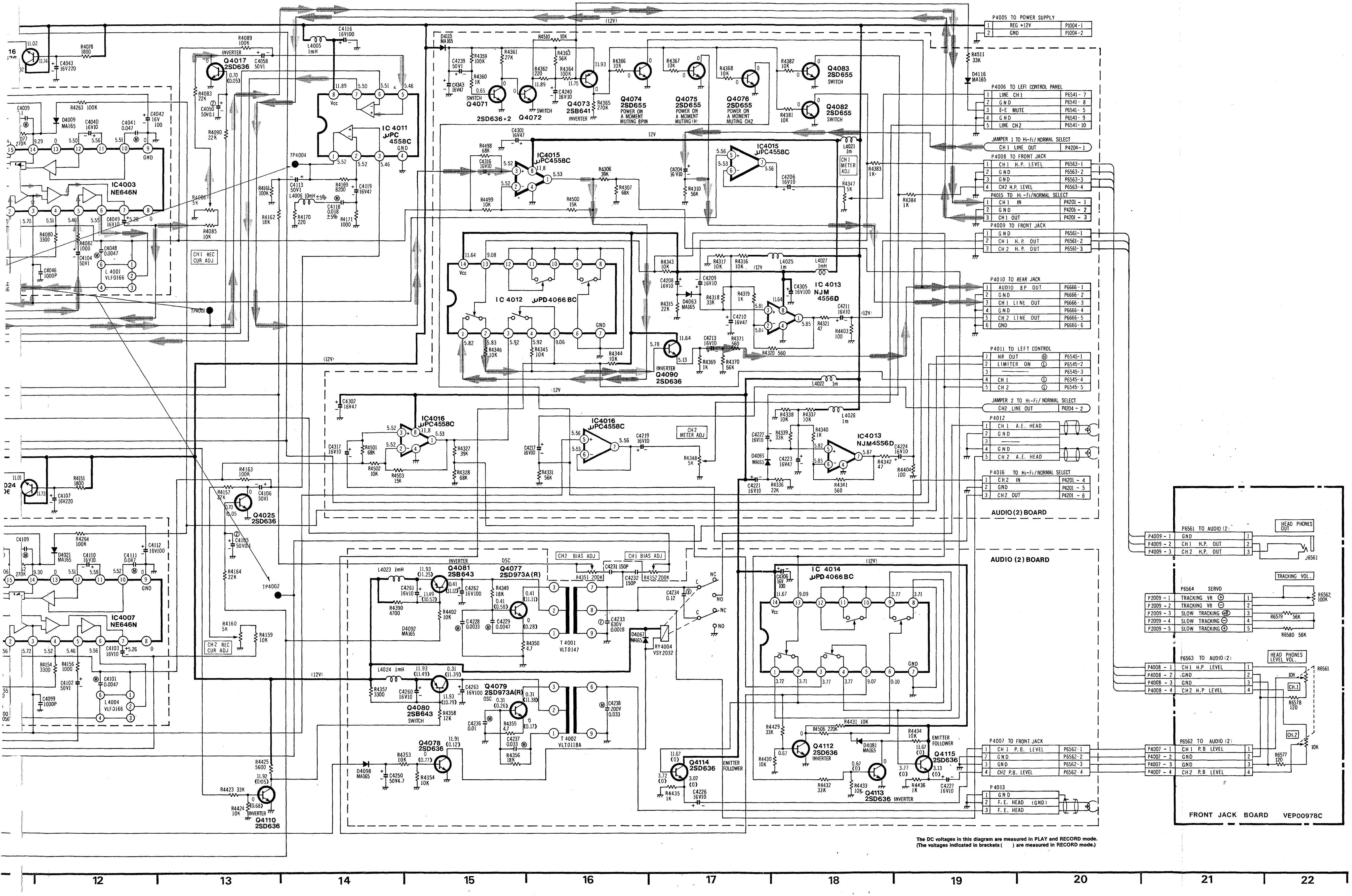
AUDIO SCHEMATIC DIAGRAM

MAIN SIGNAL PATH IN RECORD MODE.
MAIN SIGNAL PATH IN PLAYBACK MODE.
T.C. RECORD MODE PATH.
T.C. PLAYBACK MODE PATH.

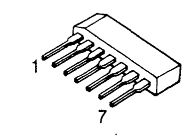


UPPER: TP4001
LOWER: TP4002
REC/PLAY 0.5V/1msec. div.
P4001 TO AUDIO VR
P6765 1 CH 1 LINE IN
P6765 2 GND
P6765 4 GND
P6765 3 CH2 LINE IN
P4002
GND
CH1 AUDIO HEAD R
CH1 AUDIO HEAD W
P4004 TO SYSTEM CONTROL
P6008-1 REC E-E +12V
P6008-2 REC R P +12V
P6008-3 DUB E-E
P6008-4 DUB R P
P6008-5 SLOW
P6008-6 X2 ~ X10 SEARCH
P4003
GND
CH2 AUDIO HEAD R
CH2 AUDIO HEAD W
P4014 TO REAR JACK
P6665 1 T.C. ON +12V
P6665 2 T.C. IN
P6665 3 GND
P6665 4 T.C. OUT
P6665 5 GND
AUDIO (2) BOARD
UPPER: TP4003
LOWER: TP4004
REC 0.5V/0.5msec. div.
Q4118 2SB643
Q4119 2SB643
INVERTER Q4002 2SD636
Q4004 2SD636
Q4006 2SD636
Q4008 2SD636
Q4009 2SB643
Q4050 2SD636
Q4101 2SB643
Q4051 2SD636
RY4001 VSY1015
RY4002 VSY1015
RY4003 VSY2027
Q4049 2SD636 EMITTER FOLLOWER
Q4100 2SD636
Q4048 2SD636 SWITCH
IC 4009 AN6912 (μPC339)
Q4045 2SD636
Q4046 2SD636
Q4047 2SD636
D4038 RD6.2EB
TP4006
IC4010 AN360 TC PB AMP
IC 4002 HA12005
IC 4006 HA12005
Q4012 2SD636 AGC AMP
Q4013 2SD636 AGC AMP
Q4014 2SB641 AGC DET
Q4015 2SD636 LIMITER SW
Q4016 2SD636
IC4003 NE646N
AUDIO (2) BOARD
Q4010 2SD655
Q4011 2SD636
Q4116 2SD636 SWITCH
TP4003
L4001 VLF0166
L4003 10mH
Q4020 2SD636 AGC AMP
Q4021 2SD636 AGC AMP
Q4022 2SB641 AGC DET
Q4023 2SD636 LIMITER SW
Q4024 2SD636
IC4007 NE646N
L4004 VLF3166
Q4018 2SD655
Q4019 2SD636
Q4117 2SD636 SWITCH
CH1 P.B. GAIN ADJ
CH2 P.B. GAIN ADJ
(12V)
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12

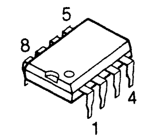
Audio (1) & Audio (2) C.B.A.
ICs & Transistors Information


IC4003 NE646N
IC4007 NE646N
IC4011 μPC4558C
IC4015 μPC4558C
IC4016 μPC4558C
IC4012 μPD4066BC
IC4013 NJM4556D
IC 4014 μPD4066BC
Q4017 2SD636 INVERTER
Q4025 2SD636
Q4071 2SD636×2
Q4072
Q4073 2SB641 INVERTER
Q4074 2SD655 POWER ON A MOMENT MUTING 8PIN
Q4075 2SD655 POWER ON A MOMENT MUTING CH1
Q4076 2SD655 POWER ON A MOMENT MUTING CH2
Q4083 2SD655 SWITCH
Q4082 2SD655 SWITCH
Q4090 2SD636 INVERTER
Q4081 2SB643 INVERTER
Q4077 2SD973A(R) OSC
Q4080 2SB643 SWITCH
Q4079 2SD973A(R) OSC
Q4078 2SD636
Q4110 2SD636 INVERTER
Q4114 2SD636 EMITTER FOLLOWER
Q4112 2SD636 INVERTER
Q4113 2SD636 INVERTER
Q4115 2SD636 EMITTER FOLLOWER
T 4001 VLT0147
T 4002 VLT0118A
RY4004 VSY2032
TP4001
TP4002
TP4004
CH1 REC CUR ADJ
CH2 REC CUR ADJ
CH1 METER ADJ
CH2 METER ADJ
CH2 BIAS ADJ
CH1 BIAS ADJ
P4005 TO POWER SUPPLY
P4006 TO LEFT CONTROL PANEL
JAMPER 1 TO Hi-Fi/NORMAL SELECT
P4008 TO FRONT JACK
P4015 TO Hi-Fi/NORMAL SELECT
P4009 TO FRONT JACK
P4010 TO REAR JACK
P4011 TO LEFT CONTROL
JAMPER 2 TO Hi-Fi/NORMAL SELECT
P4012
P4016 TO Hi-Fi/NORMAL SELECT
P4007 TO FRONT JACK
P4013
AUDIO (2) BOARD
P6561 TO AUDIO (2)
HEAD PHONES OUT
J6561
TRACKING VOL.
P6564 SERVO
P6563 TO AUDIO (2)
HEAD PHONES LEVEL VOL.
P6562 TO AUDIO (2)
FRONT JACK BOARD VEP00978C
12
13
14
15
16
17
18
19
20
21
22

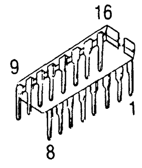
The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)



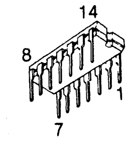
AN360



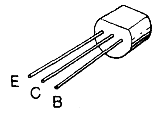
μPC4558C
NJM4556D



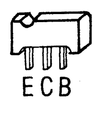
HA12005
NE646N



μPD4066BC
AN6912

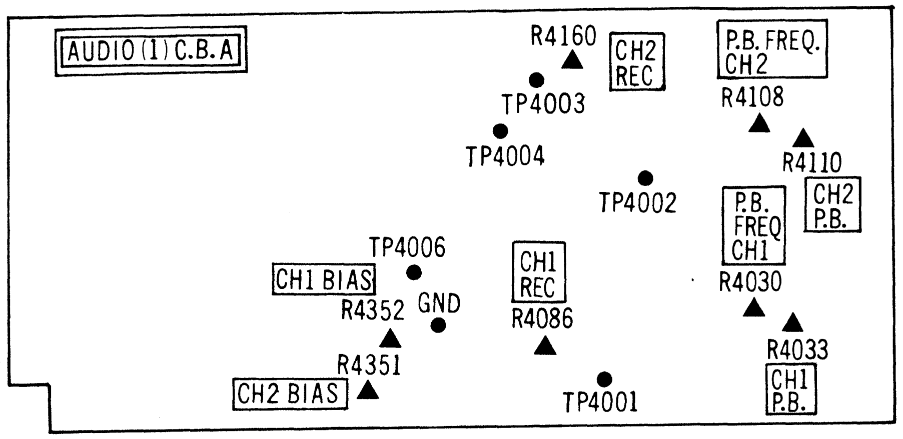


2SD655



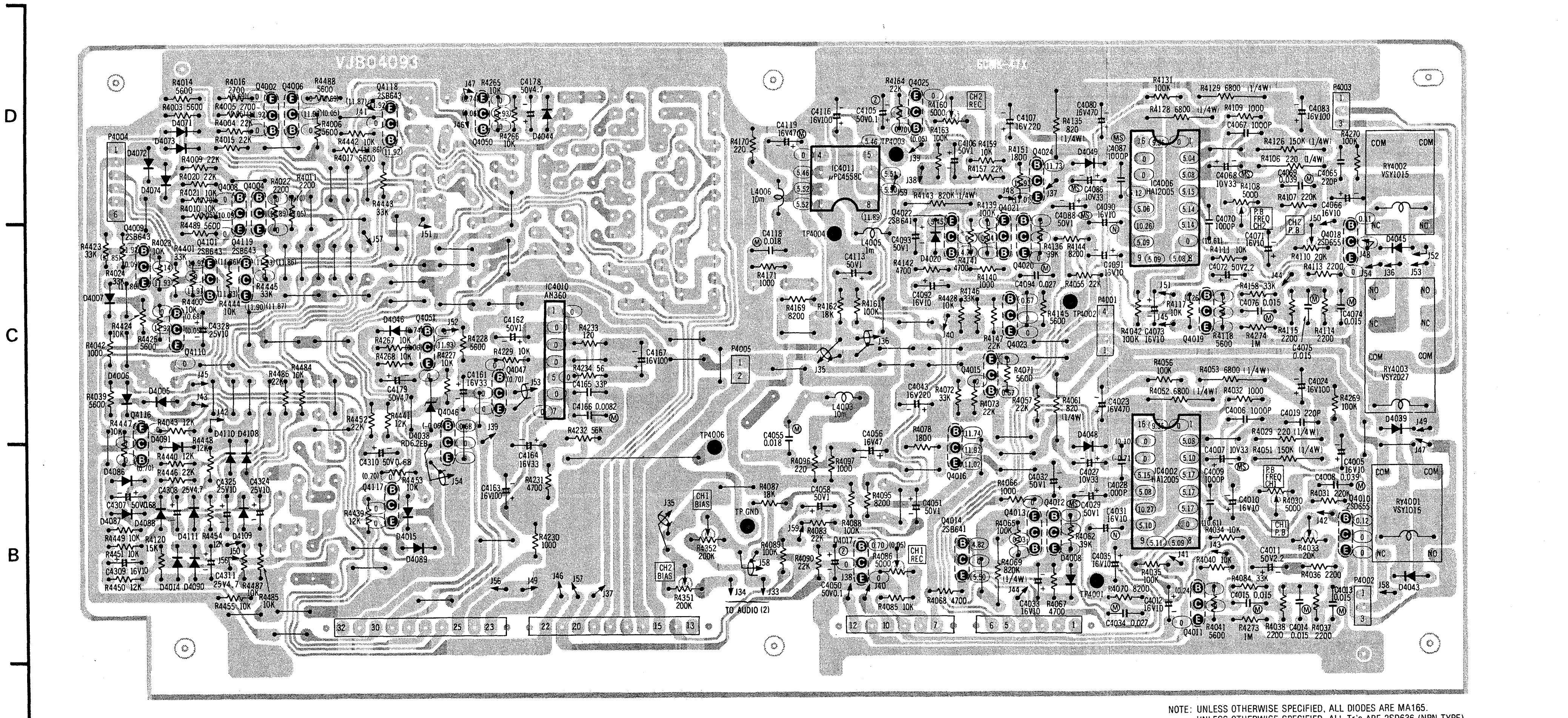
2SB641
2SB643
2SD636
2SD638

AUDIO (1) C.B.A. (VEP04093F)


AUDIO (1) C.B.A
R4160
CH2 REC
P.B. FREQ. CH2
TP4003
R4108
TP4004
R4110
CH2 P.B.
TP4002
P.B. FREQ CH1
TP4006
CH1 REC
R4030
CH1 BIAS
R4352
GND
R4086
R4033
R4351
CH1 P.B.
CH2 BIAS
TP4001

Audio (1) C.B.A. (VEP04093F)			
Q4002	D-2	Q4023	C-5
Q4004	C-1	Q4024	D-5
Q4006	D-2	Q4025	D-5
Q4008	C-1	Q4046	B-2
Q4009	C-1	Q4047	C-3
Q4010	B-7	Q4050	D-3
Q4011	B-6	Q4051	C-2
Q4012	B-5	Q4101	C-1
Q4013	B-5	Q4110	C-1
Q4014	B-5	Q4116	B-1
Q4015	C-5	Q4117	B-2
Q4016	B-5	Q4118	D-2
Q4017	B-4	Q4119	C-1
Q4018	C-7		
Q4019	C-6	IC4002	B-6
Q4020	C-5	IC4006	C-6
Q4021	C-5	IC4010	C-3
Q4022	C-5	IC4011	D-4

Audio (2) C.B.A. (VEP04094F)			
Q4045	D-5	Q4090	B-4
Q4048	C-6	Q4100	C-7
Q4049	B-6	Q4112	C-4
Q4071	C-4	Q4113	C-4
Q4072	C-3	Q4114	D-4
Q4073	C-4	Q4115	D-4
Q4074	C-3		
Q4075	C-3	IC4003	B-2
Q4076	C-3	IC4007	D-2
Q4077	D-6	IC4009	D-5
Q4078	B-7	IC4012	B-4
Q4079	D-6	IC4013	B-5
Q4080	D-7	IC4014	D-4
Q4081	C-6	IC4015	B-3
Q4082	C-4	IC4016	D-3
Q4083	C-5		


D
C
B
A
VJB04093
P4004
P4005
P4001
P4002
P4003
IC4010 AN360
IC4011 μPC4558C
IC4006 HA12005
IC4002 HA12005
RY4002 VSY1015
RY4003 VSY2027
RY4001 VSY1015
TP4006
TP GND
CH1 BIAS
CH2 BIAS
CH1 REC
CH2 REC
TO AUDIO (2)

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165.
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

P4004 TO SYSTEM CONTROL P6008

1	REC E-E +12V
2	REC R/P +12V
3	DUB E-E Ⓛ
4	DUB R/P Ⓛ
5	SLOW Ⓛ
6	×2～×10 SEARCH Ⓛ

P4005 TO POWER SUPPLY P1004

1	REG. +12V
2	GND

P4001 TO AUDIO VR P6765

1	CH1 LINE IN
2	GND
3	GND
4	CH2 LINE IN

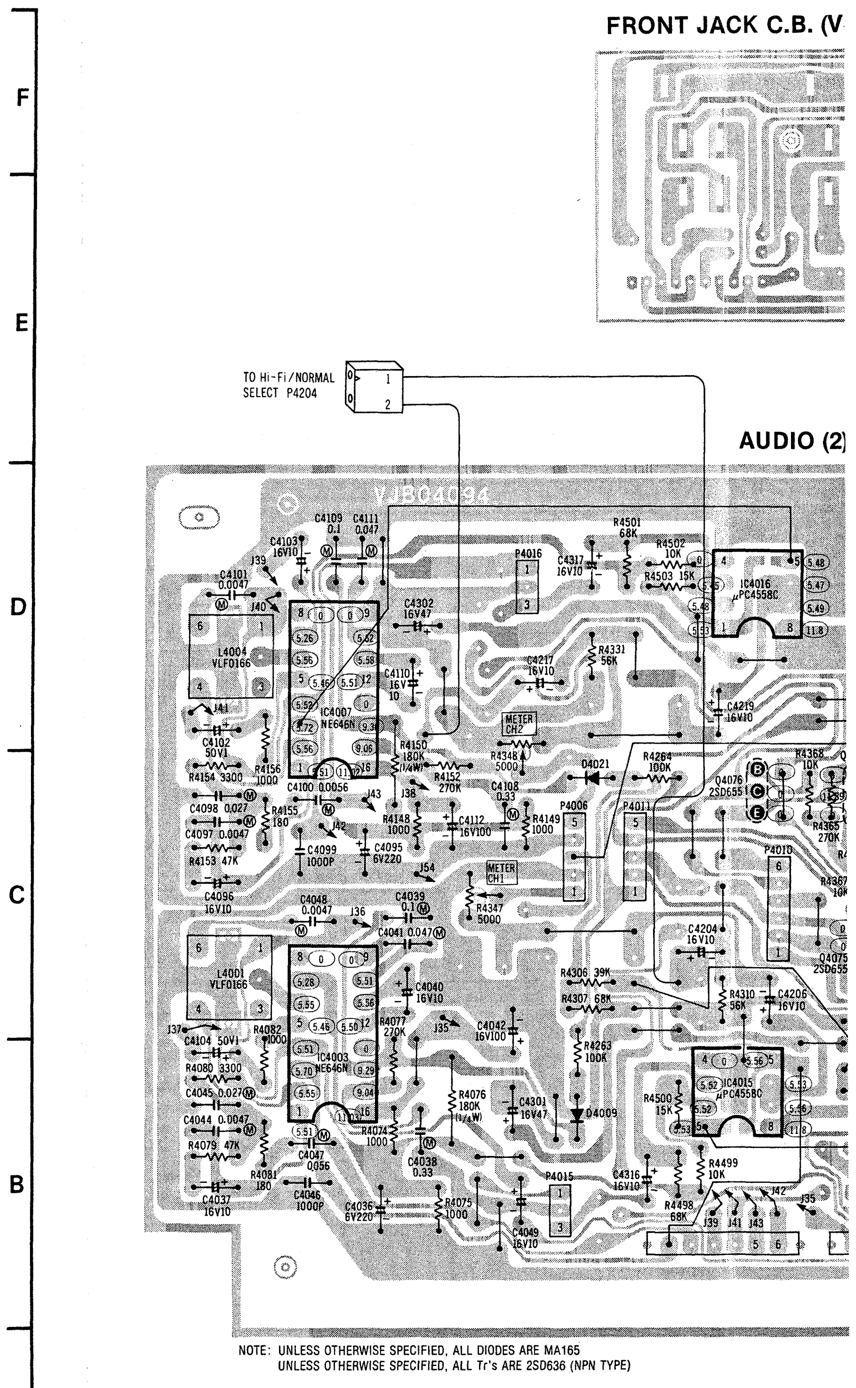
P4002 TO AUDIO HEAD

1	GND
2	CH1 AUDIO HEAD (R)
3	CH1 AUDIO HEAD (W)

P4003 TO AUDIO HEAD

1	GND
2	CH2 AUDIO HEAD (R)
3	CH2 AUDIO HEAD (W)

AUDIO (2) C.B.A. (VEP04094F) & FRONT JACK C.B.A. (VJB00978)


FRONT JACK C.B. (V
F
E
D
C
B
TO Hi-Fi/NORMAL SELECT P4204
AUDIO (2)
VJB04094
P4016
P4006
P4011
P4015
IC4016 μPC4558C
IC4001 NE646N
IC4003 NE646N
IC4015 μPC4558C
L4004 VLF0166
L4001 VLF0166
METER CH2
METER CH1

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE)

P4006 TO LEFT CONTROL PANEL P6541

1	LINE CH1
2	GND
3	E-E MUTE
4	GND
5	LINE CH2

P4011 TO LEFT CONTROL PANEL P6545

1	NR OUT Ⓗ
2	LIMITER ON Ⓛ
3	———
4	CH1 Ⓛ
5	CH2 Ⓛ

P4010 TO REAR JACK P

1	AUDIO 8P OUT
2	GND
3	CH1 LINE OUT
4	GND
5	CH2 LINE OUT
6	GND

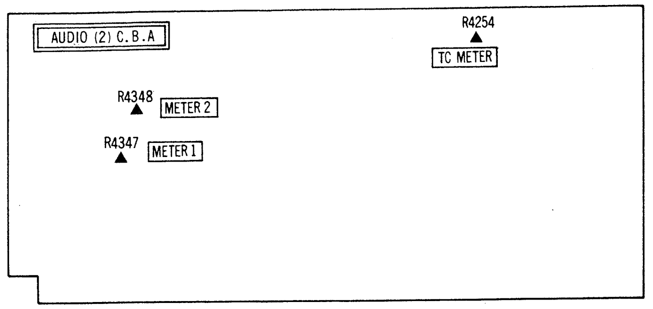
P4016 TO Hi-Fi/NORMAL SELECT P4201

1	CH2 IN
2	GND
3	CH2 OUT

P4015 TO Hi-Fi/NORMAL SELECT P4201

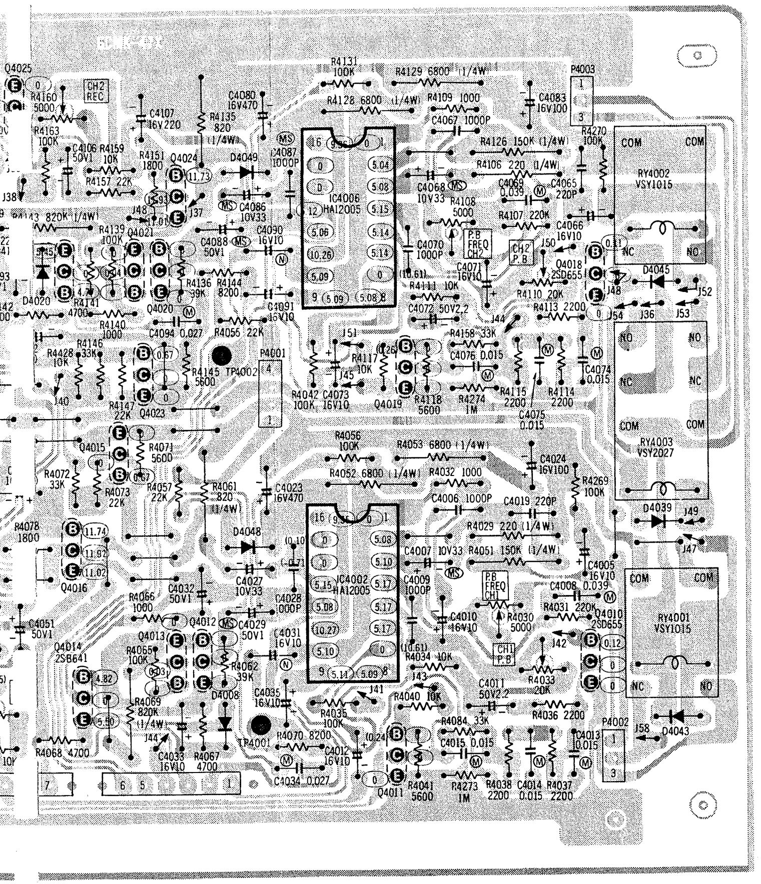
1	CH1 IN
2	GND
3	CH1 OUT

AUDIO (2) C.B.A. (VEP04094F)
& FRONT JACK C.B.A. (VJB00978)


AUDIO (2) C.B.A
R4254
TC METER
R4348
METER 2
R4347
METER 1

io (1) C.B.A. EP04093F)	
Q4023	C-5
Q4024	D-5
Q4025	D-5
Q4046	B-2
Q4047	C-3
Q4050	D-3
Q4051	C-2
Q4101	C-1
Q4110	C-1
Q4116	B-1
Q4117	B-2
Q4118	D-2
Q4119	C-1
IC4002	B-6
IC4006	C-6
IC4010	C-3
IC4011	D-4

Audio (2) C.B.A. (VEP04094F)			
Q4045	D-5	Q4090	B-4
Q4048	C-6	Q4100	C-7
Q4049	B-6	Q4112	C-4
Q4071	C-4	Q4113	C-4
Q4072	C-3	Q4114	D-4
Q4073	C-4	Q4115	D-4
Q4074	C-3		
Q4075	C-3	IC4003	B-2
Q4076	C-3	IC4007	D-2
Q4077	D-6	IC4009	D-5
Q4078	B-7	IC4012	B-4
Q4079	D-6	IC4013	B-5
Q4080	D-7	IC4014	D-4
Q4081	C-6	IC4015	B-3
Q4082	C-4	IC4016	D-3
Q4083	C-5		


CH2 REC
RY4002 VSY1015
RY4003 VSY2027
RY4001 VSY1015
IC4006 HA12005
IC4002 HA12005
P4003
P4001
P4002
COM
NC
NO
5
6
7

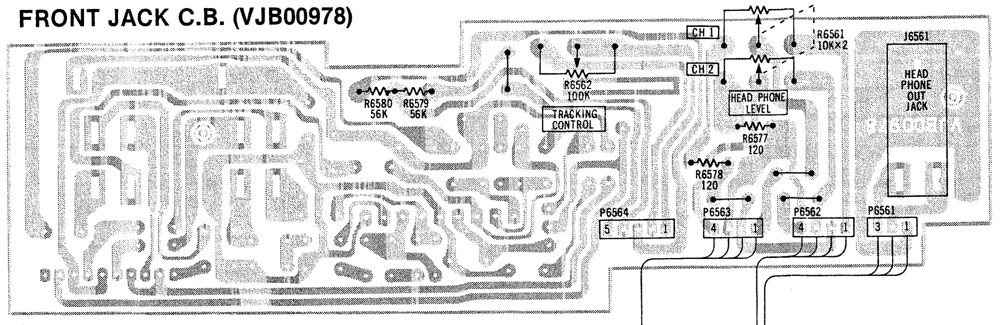
NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165.
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE).

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

P4003 TO AUDIO HEAD

1	GND
2	CH2 AUDIO HEAD (R)
3	CH2 AUDIO HEAD (W)

FRONT JACK C.B. (VJB00978)


CH1
CH2
R6561 10K×2
J6561
HEAD PHONE OUT JACK
HEAD PHONE LEVEL
R6562 100K
TRACKING CONTROL
R6580 56K
R6579 56K
R6578 120
R6577 120
P6564
P6563
P6562
P6561
F
E

P6561 TO AUDIO (2) P4009

1	GND
2	CH1 H.P. OUT
3	CH2 H.P. OUT

P6562 TO AUDIO (2) P4007

1	CH1 P.B. LEVEL
2	GND
3	GND
4	CH2 P.B. LEVEL

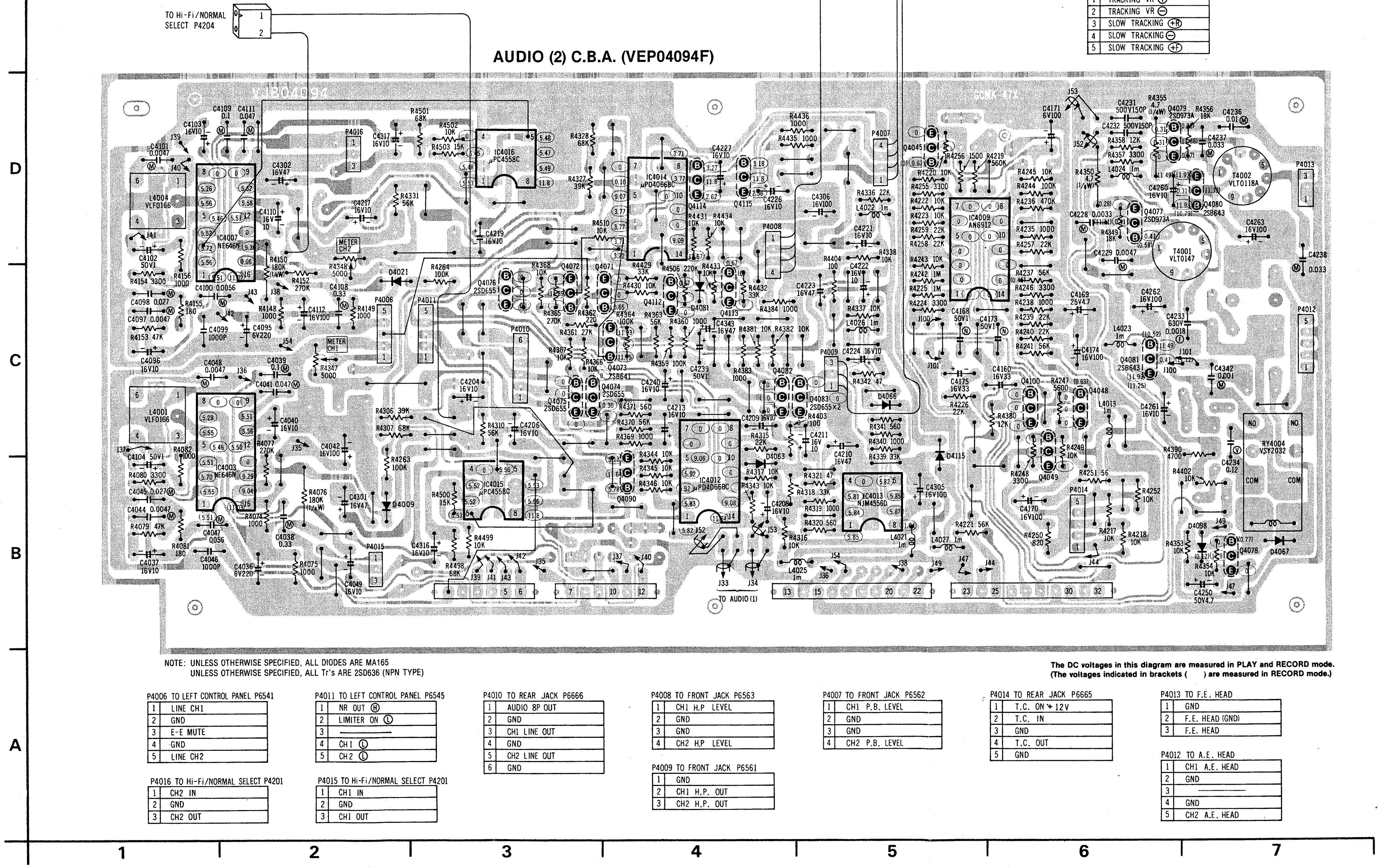
P6563 TO AUDIO (2) P4008

1	CH1 H.P. LEVEL
2	GND
3	GND
4	CH2 H.P. LEVEL

P6564 TO SERVO P2009

1	TRACKING VR ⊕
2	TRACKING VR ⊖
3	SLOW TRACKING (+R)
4	SLOW TRACKING ⊖
5	SLOW TRACKING (+F)

AUDIO (2) C.B.A. (VEP04094F)


TO Hi-Fi/NORMAL SELECT P4204
IC4007 NE646N
IC4003 NE646N
IC4016 μPC4558C
IC4015 μPC4558C
IC4014 μPD4066BC
IC4012 μPD4066BC
IC4009 AN6912
IC4013 NJM4556D
L4004 VLFD166
L4001 VLFD166
METER CH2
METER CH1
RY4004 VSY2032
T4002 VLT0118A
T4001 VLT0147
P4016
P4011
P4010
P4008
P4007
P4009
P4006
P4015
P4014
P4012
P4013
TO AUDIO (1)
D
C
B
A
1
2
3
4
5
6
7

NOTE: UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE MA165
UNLESS OTHERWISE SPECIFIED, ALL Tr's ARE 2SD636 (NPN TYPE)

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

P4006 TO LEFT CONTROL PANEL P6541

1	LINE CH1
2	GND
3	E-E MUTE
4	GND
5	LINE CH2

P4016 TO Hi-Fi/NORMAL SELECT P4201

1	CH2 IN
2	GND
3	CH2 OUT

P4011 TO LEFT CONTROL PANEL P6545

1	NR OUT Ⓗ
2	LIMITER ON Ⓛ
3	————
4	CH1 Ⓛ
5	CH2 Ⓛ

P4015 TO Hi-Fi/NORMAL SELECT P4201

1	CH1 IN
2	GND
3	CH1 OUT

P4010 TO REAR JACK P6666

1	AUDIO 8P OUT
2	GND
3	CH1 LINE OUT
4	GND
5	CH2 LINE OUT
6	GND

P4008 TO FRONT JACK P6563

1	CH1 H.P LEVEL
2	GND
3	GND
4	CH2 H.P LEVEL

P4009 TO FRONT JACK P6561

1	GND
2	CH1 H.P. OUT
3	CH2 H.P. OUT

P4007 TO FRONT JACK P6562

1	CH1 P.B. LEVEL
2	GND
3	GND
4	CH2 P.B. LEVEL

P4014 TO REAR JACK P6665

1	T.C. ON +12V
2	T.C. IN
3	GND
4	T.C. OUT
5	GND

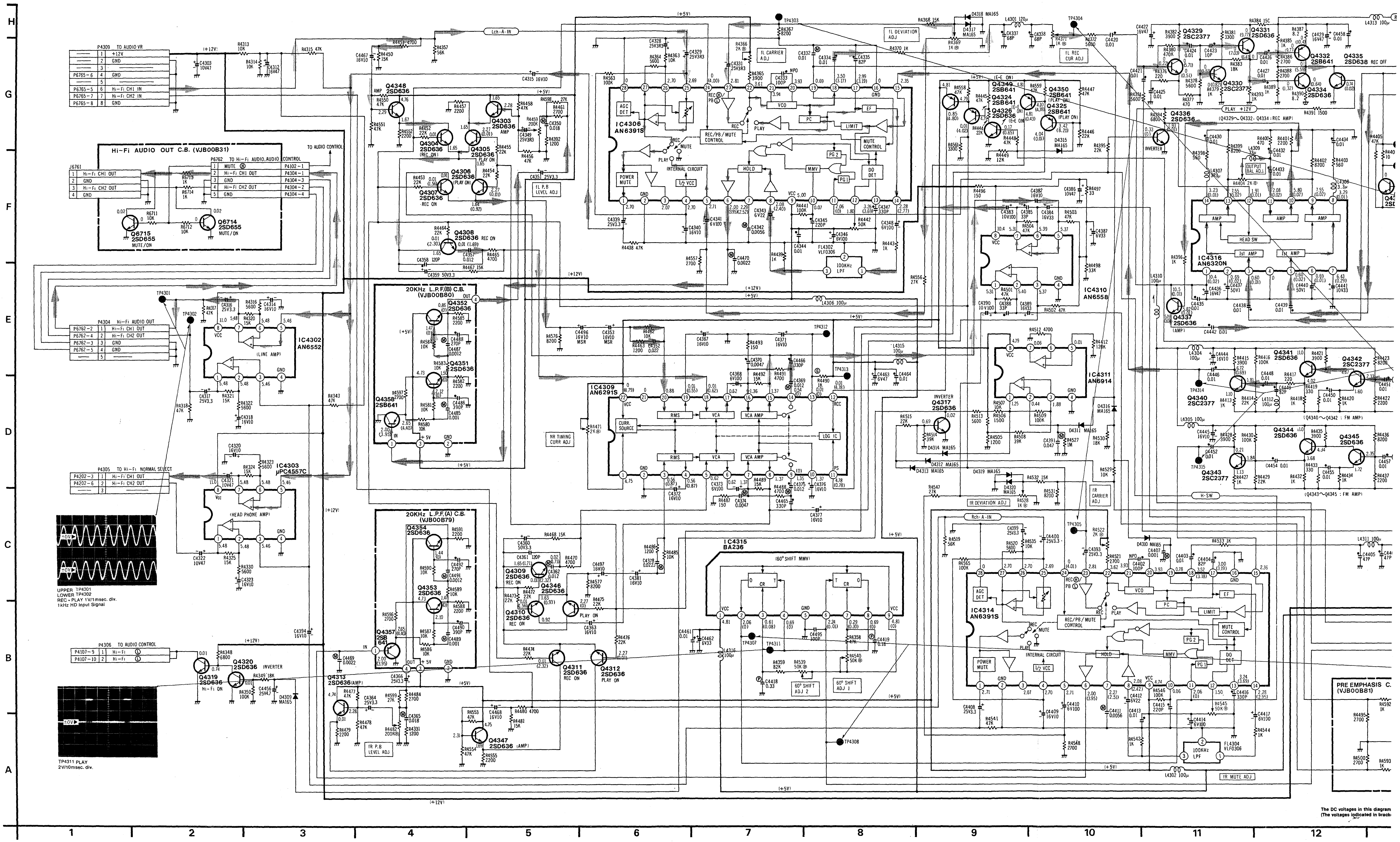
P4013 TO F.E. HEAD

1	GND
2	F.E. HEAD (GND)
3	F.E. HEAD

P4012 TO A.E. HEAD

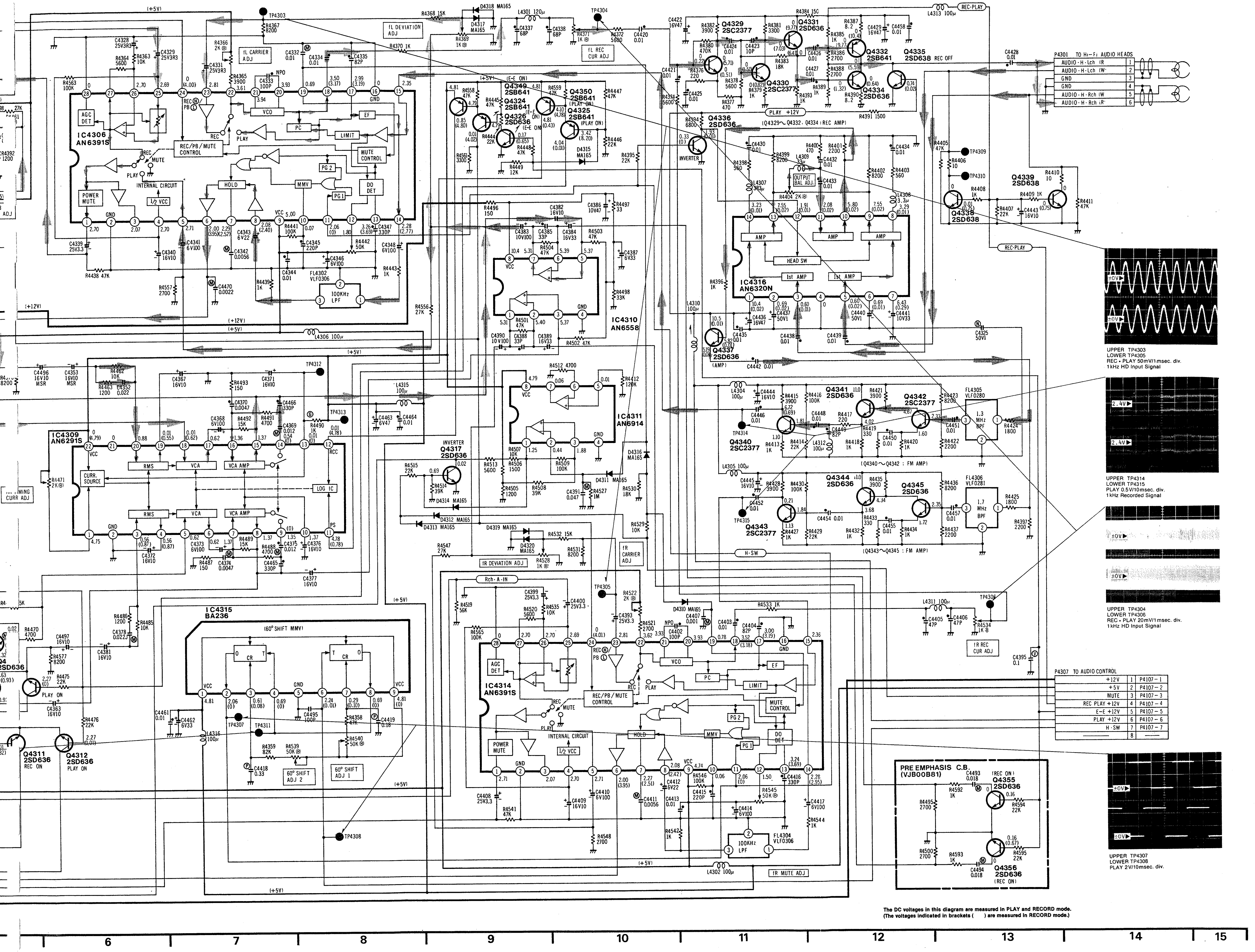
1	CH1 A.E. HEAD
2	GND
3	————
4	GND
5	CH2 A.E. HEAD

Hi-Fi AUDIO SCHEMATIC DIAGRAM



H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
P4309 TO AUDIO VR
+12V
GND
Hi-Fi CH1 IN
Hi-Fi CH2 IN
Hi-Fi AUDIO OUT C.B. (VJB00B31)
P6762 TO Hi-Fi AUDIO, AUDIO CONTROL
MUTE
Hi-Fi CH1 OUT
Hi-Fi CH2 OUT
GND
TO AUDIO CONTROL
Q6715 2SD655 MUTE/ON
Q6714 2SD655 MUTE/ON
P4304 Hi-Fi AUDIO OUT
TP4301
TP4302
IC4302 AN6552
(LINE AMP)
P4305 TO Hi-Fi NORMAL SELECT
IC4303 µPC4557C
(HEAD PHONE AMP)
UPPER TP4301
LOWER TP4302
REC • PLAY 1V/1msec. div.
1kHz HD Input Signal
P4306 TO AUDIO CONTROL
Q4319 2SD636 Hi-Fi ON
Q4320 2SD636 INVERTER
TP4311 PLAY
2V/10msec. div.
Lch-A-IN
Q4348 2SD636 AMP
Q4303 2SD636 AMP
Q4304 2SD636 (REC ON)
Q4305 2SD636 PLAY ON
Q4306 2SD636 (PLAY ON)
Q4307 2SD636 REC ON
Q4308 2SD636 REC ON
fL P.B LEVEL ADJ
20KHz L.P.F.(B) C.B. (VJB00B80)
Q4352 2SD636
Q4351 2SD636
Q4358 2SB641
20KHz L.P.F.(A) C.B. (VJB00B79)
Q4354 2SD636
Q4353 2SD636
Q4357 2SB641
Q4313 2SD636 (AMP)
fR P.B LEVEL ADJ
Q4347 2SD636 (AMP)
Q4309 2SD636 REC ON
Q4346 2SD636
Q4310 2SD636 REC ON
Q4311 2SD636 REC ON
Q4312 2SD636 PLAY ON
TP4303
fL CARRIER ADJ
IC4306 AN6391S
AGC DET
REC/PB/MUTE CONTROL
VCO
PC
EF
LIMIT
MUTE CONTROL
POWER MUTE
INTERNAL CIRCUIT
1/2 VCC
HOLD
MMV
PG 2
PG 1
DO DET
FL4302 VLF0306
100KHz LPF
fL DEVIATION ADJ
fL REC CUR ADJ
TP4304
Q4349 2SB641
Q4324 2SB641
Q4326 2SD636
Q4350 2SB641 (PLAY ON)
Q4325 2SB641 (PLAY ON)
IC4310 AN6558
NR TIMING CURR ADJ
IC4309 AN6291S
CURR. SOURCE
RMS
VCA
VCA AMP
LOG IC
TP4312
TP4313
IC4311 AN6914
Q4317 2SD636 INVERTER
IC4315 BA236
(60° SHIFT MMV)
CR
60° SHIFT ADJ 2
60° SHIFT ADJ 1
TP4307
TP4308
fR DEVIATION ADJ
fR CARRIER ADJ
TP4305
Rch-A-IN
IC4314 AN6391S
FL4304 VLF0306
fR MUTE ADJ
Q4329 2SC2377
Q4331 2SD636
Q4332 2SB641
Q4335 2SD638 REC OFF
Q4330 2SC2377
Q4334 2SD636
Q4336 2SD636 INVERTER
(Q4329~Q4332, Q4334 : REC AMP)
PLAY +12V
OUTPUT BAL ADJ
IC4316 AN6320N
AMP
HEAD SW
1st AMP
Q4337 2SD636 (AMP)
Q4341 2SD636
Q4342 2SC2377
Q4340 2SC2377
(Q4340~Q4342 : FM AMP)
Q4344 2SD636
Q4345 2SD636
Q4343 2SC2377
(Q4343~Q4345 : FM AMP)
H-SW
PRE EMPHASIS C. (VJB00B81)
(+5V)
(+12V)

The DC voltages in this diagram
(The voltages indicated in brack


IC4306
AN6391S
IC4309
AN6291S
IC4310
AN6558
IC4311
AN6914
IC4314
AN6391S
IC4315
BA236
IC4316
AN6320N
PRE EMPHASIS C.B.
(VJB00B81)
Q4355
2SD636
Q4356
2SD636
(REC ON)
P4301 TO Hi-Fi AUDIO HEADS
AUDIO·H·Lch (R)
AUDIO·H·Lch (W)
GND
GND
AUDIO·H·Rch (W)
AUDIO·H·Rch (R)
P4307 TO AUDIO CONTROL
+12V 1 P4107-1
+5V 2 P4107-2
MUTE 3 P4107-3
REC PLAY +12V 4 P4107-4
E-E +12V 5 P4107-5
PLAY +12V 6 P4107-6
H·SW 7 P4107-7
8
UPPER TP4303
LOWER TP4305
REC • PLAY 50mV/1msec. div.
1kHz HD Input Signal
UPPER TP4314
LOWER TP4315
PLAY 0.5V/10msec. div.
1kHz Recorded Signal
UPPER TP4304
LOWER TP4306
REC • PLAY 20mV/1msec. div.
1kHz HD Input Signal
UPPER TP4307
LOWER TP4308
PLAY 2V/10msec. div.
6
7
8
9
10
11
12
13
14
15

The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets (   ) are measured in RECORD mode.)

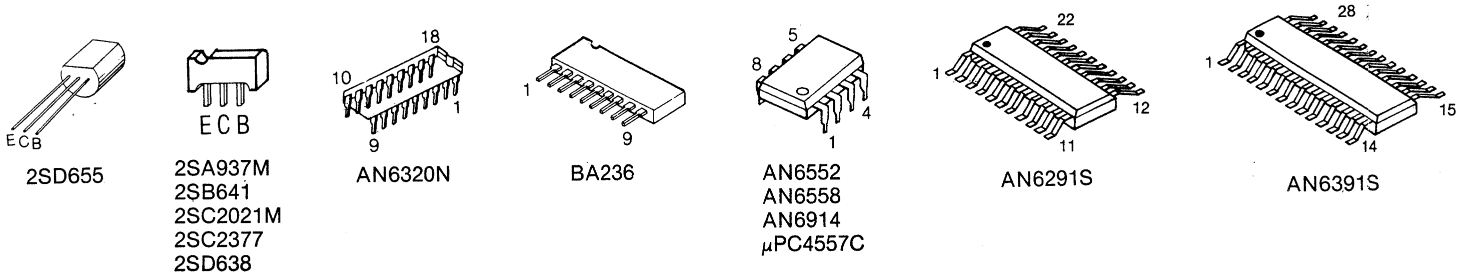
Hi-Fi Audio C.B.A. (VEP0482B1)			
Q4303	D-6	Q4341	B-2
Q4304	D-6	Q4342	B-2
Q4305	D-6	Q4343	B-3
Q4306	D-6	Q4344	B-3
Q4307	D-6	Q4345	B-2
Q4308	B-6	Q4346	B-7
Q4309	B-7	Q4347	B-7
Q4310	B-7	Q4348	D-6
Q4311	B-7	Q4349	D-7
Q4312	B-7	Q4350	D-7
Q4313	B-7	Q4351	E-5
Q4317	D-6	Q4352	E-6
Q4319	D-7	Q4353	A-5
Q4320	D-7	Q4354	A-6
Q4324	D-7	Q4355	E-8
Q4325	D-7	Q4356	E-8
Q4326	D-7	Q4357	A-5
Q4329	C-3	Q4358	E-8
Q4330	D-3		
Q4331	D-3	IC4302	C-9
Q4332	D-3	IC4303	C-9
Q4334	D-2	IC4306	D-4
Q4335	D-2	IC4309	C-7
Q4336	C-2	IC4310	C-5
Q4337	C-3	IC4311	C-5
Q4338	C-2	IC4314	C-4
Q4339	D-2	IC4315	D-9
Q4340	B-3	IC4316	D-2

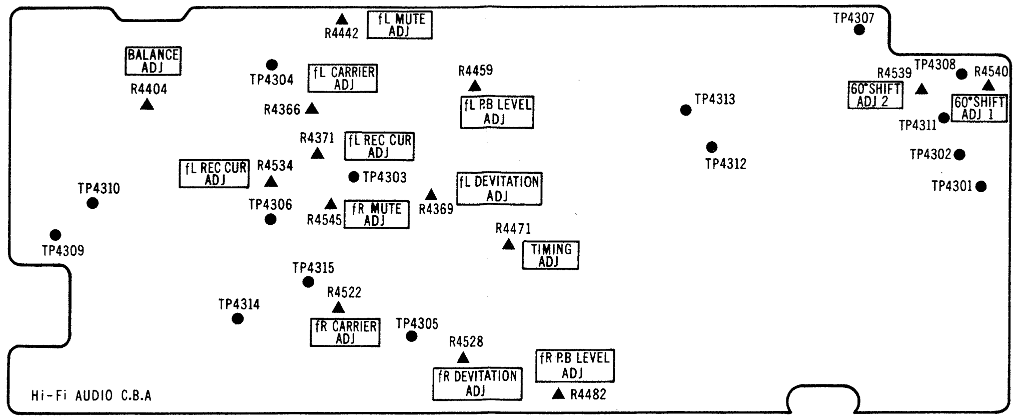
Hi-Fi Audio Out C.B. (VJB00B31)	
Q6764	C-10
Q6765	C-10

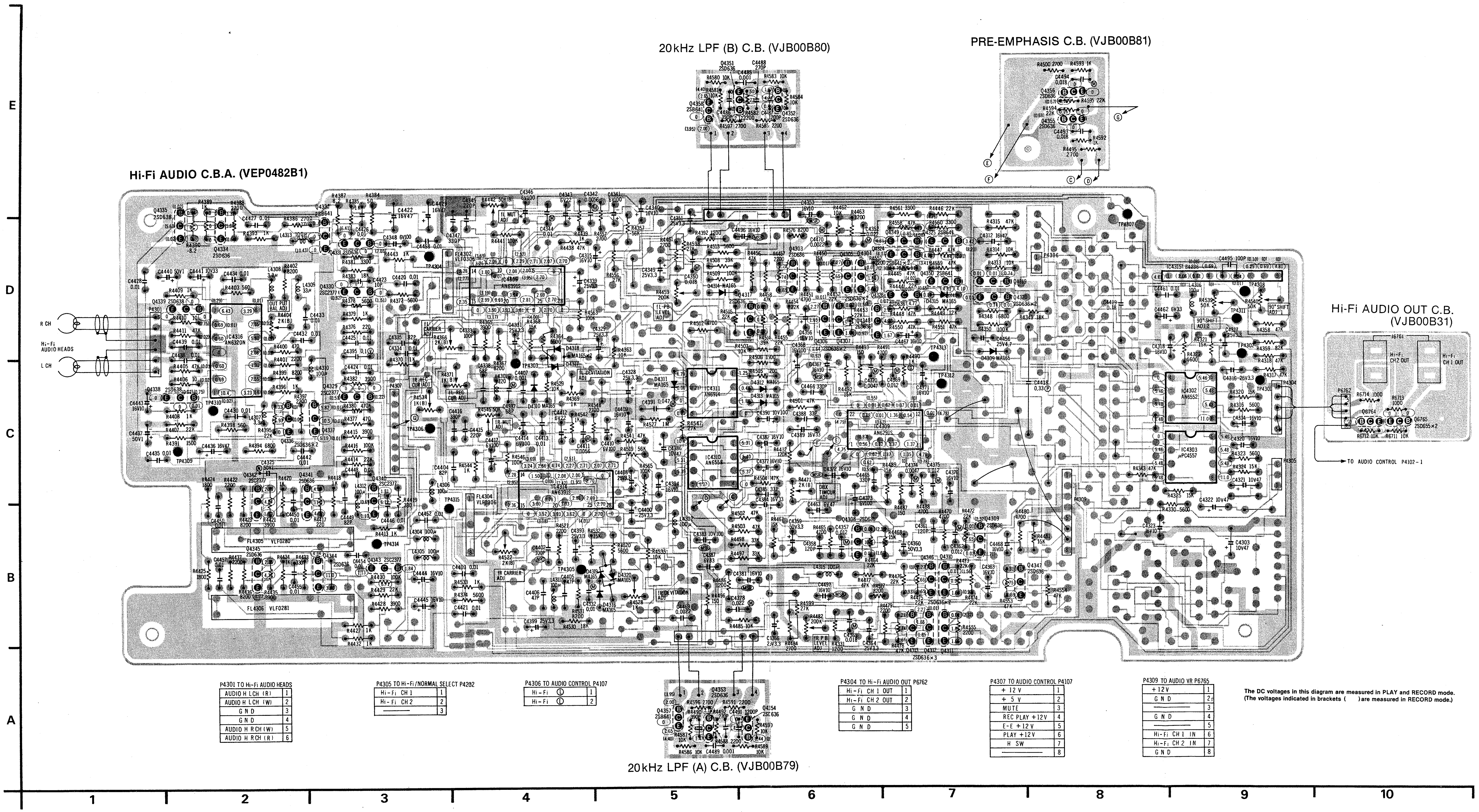
Hi-Fi AUDIO RECORDING SIGNAL PATH
Hi-Fi AUDIO PLAYBACK SIGNAL PATH

Hi-Fi AUDIO C.B.A. (VEP0482B1) & SMALL BOARDS.

Hi-Fi Audio C.B.A. ICs & Transistors Information


E C B
2SD655
E C B
2SA937M
2SB641
2SC2021M
2SC2377
2SD638
18
10
9
1
AN6320N
9
1
BA236
5
8
4
1
AN6552
AN6558
AN6914
μPC4557C
22
1
11
12
AN6291S
28
1
14
15
AN6391S


fL MUTE ADJ
R4442
BALANCE ADJ
R4404
TP4304
fL CARRIER ADJ
R4366
R4459
fL PB LEVEL ADJ
TP4313
TP4307
TP4308
R4539
R4540
60°SHIFT ADJ 2
60°SHIFT ADJ 1
TP4311
R4371
fL REC CUR ADJ
fL REC CUR ADJ
R4534
TP4303
TP4312
TP4302
TP4310
fL DEVITATION ADJ
TP4301
TP4306
R4545
fR MUTE ADJ
R4369
R4471
TIMING ADJ
TP4309
TP4315
R4522
TP4314
fR CARRIER ADJ
TP4305
R4528
fR PB LEVEL ADJ
fR DEVITATION ADJ
R4482
Hi-Fi AUDIO C.B.A


20kHz LPF (B) C.B. (VJB00B80)
PRE-EMPHASIS C.B. (VJB00B81)
Hi-Fi AUDIO C.B.A. (VEP0482B1)
Hi-Fi AUDIO OUT C.B. (VJB00B31)
20kHz LPF (A) C.B. (VJB00B79)
R CH
Hi-Fi AUDIO HEADS
L CH
TO AUDIO CONTROL P4102-1
IC4316 AN6320N
IC4311 AN6914
IC4310 AN6558
IC4309 AN6291S
IC4302 AN6552
IC4303 μPC4557
IC4308 AN6391S
IC4306 AN6391S
FL4302 VLF0302
FL4304 VLF0306
FL4305 VLF0280
FL4306 VLF0281
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10

P4301 TO Hi-Fi AUDIO HEADS

AUDIO H LCH (R)	1
AUDIO H LCH (W)	2
G N D	3
G N D	4
AUDIO H RCH (W)	5
AUDIO H RCH (R)	6

P4305 TO Hi-Fi/NORMAL SELECT P4202

Hi-Fi CH 1	1
Hi-Fi CH 2	2
———	3

P4306 TO AUDIO CONTROL P4107

Hi-Fi Ⓛ	1
Hi-Fi Ⓛ	2

P4304 TO Hi-Fi AUDIO OUT P6762

Hi-Fi CH 1 OUT	1
Hi-Fi CH 2 OUT	2
G N D	3
G N D	4
G N D	5

P4307 TO AUDIO CONTROL P4107

+ 12 V	1
+ 5 V	2
MUTE	3
REC PLAY +12V	4
E-E +12V	5
PLAY +12V	6
H SW	7
———	8

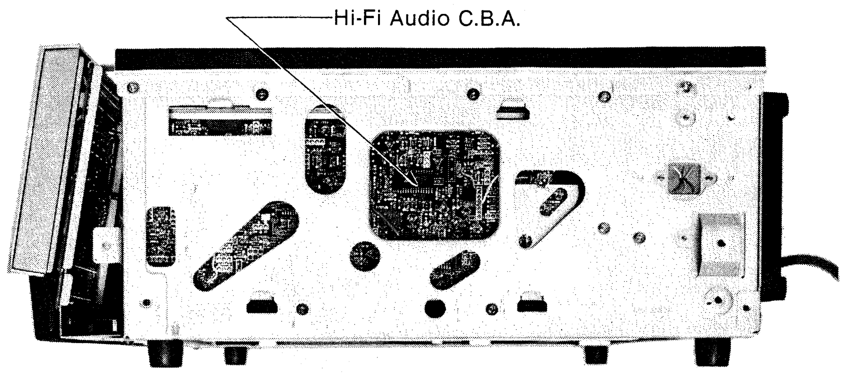
P4309 TO AUDIO VR P6765

+12V	1
G N D	2
———	3
G N D	4
———	5
Hi-Fi CH 1 IN	6
Hi-Fi CH 2 IN	7
G N D	8

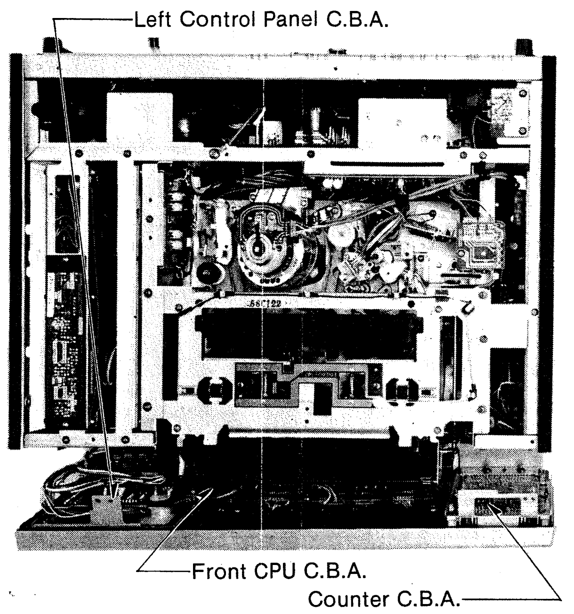
The DC voltages in this diagram are measured in PLAY and RECORD mode.
(The voltages indicated in brackets ( ) are measured in RECORD mode.)

CIRCUIT BOARDS LAYOUT

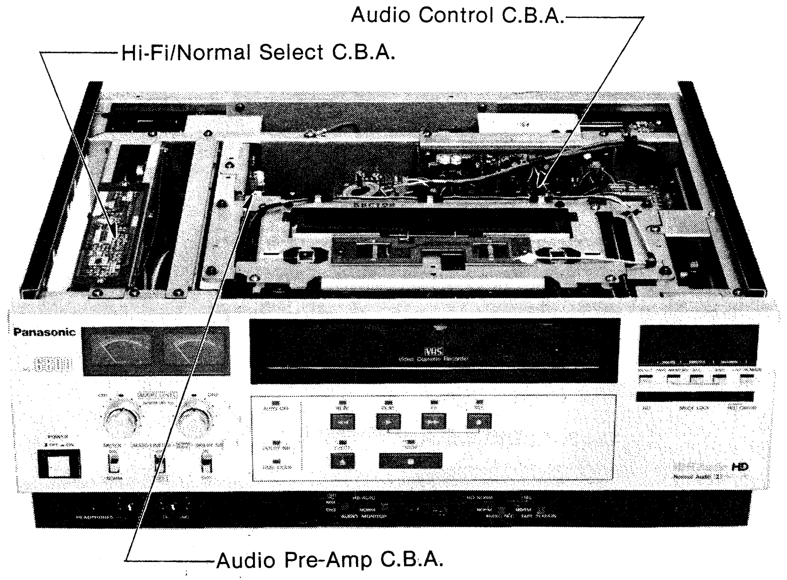
Right Side View


Hi-Fi Audio C.B.A.

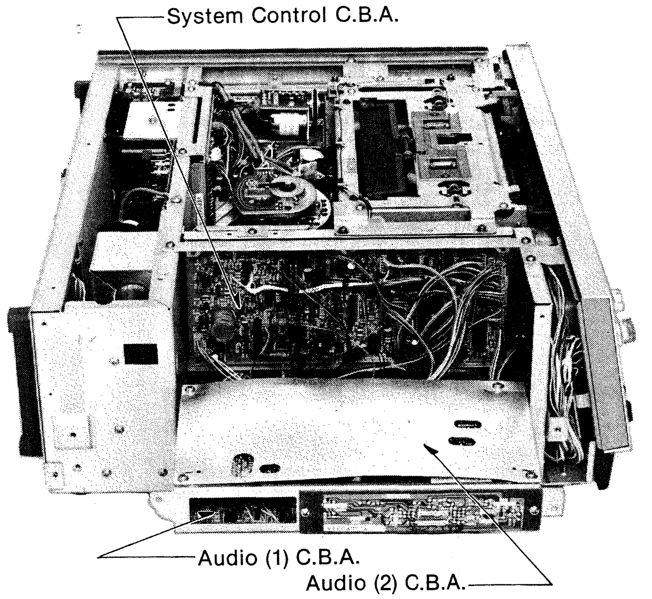
Top View


Left Control Panel C.B.A.
Front CPU C.B.A.
Counter C.B.A.

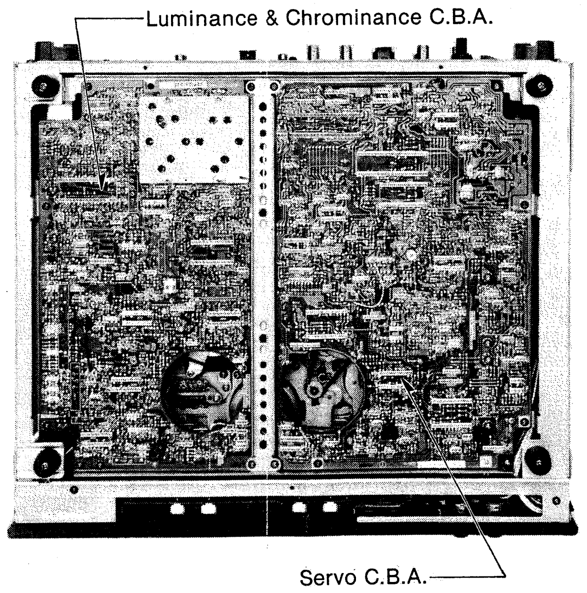
Front View


Audio Control C.B.A.
Hi-Fi/Normal Select C.B.A.
Panasonic
Audio Pre-Amp C.B.A.

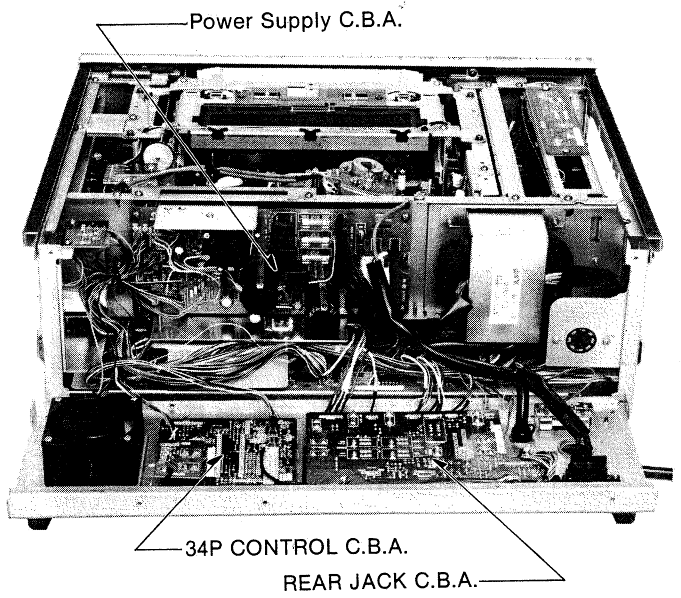
Left Side View


System Control C.B.A.
Audio (1) C.B.A.
Audio (2) C.B.A.

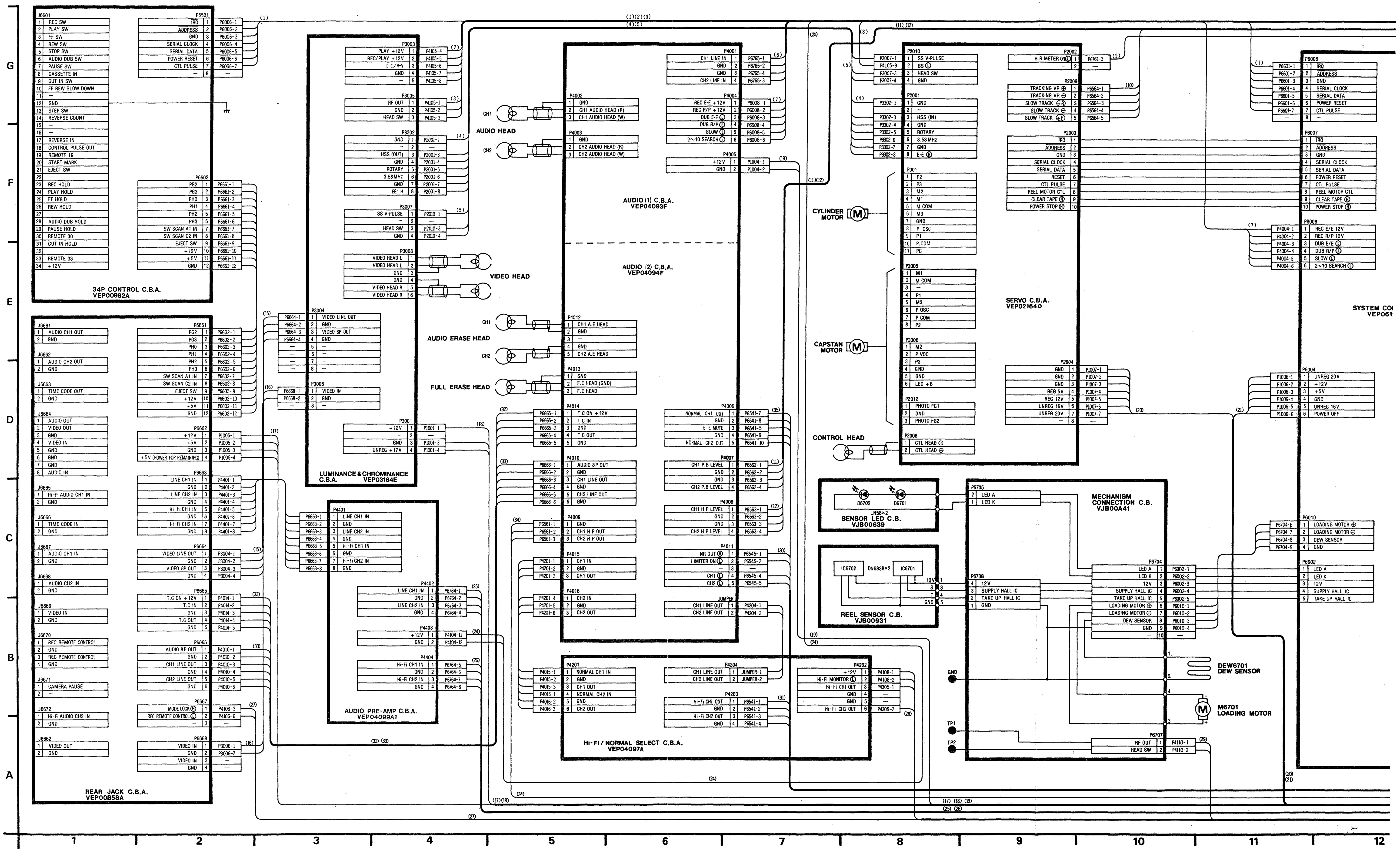
Bottom View


Luminance & Chrominance C.B.A.
Servo C.B.A.

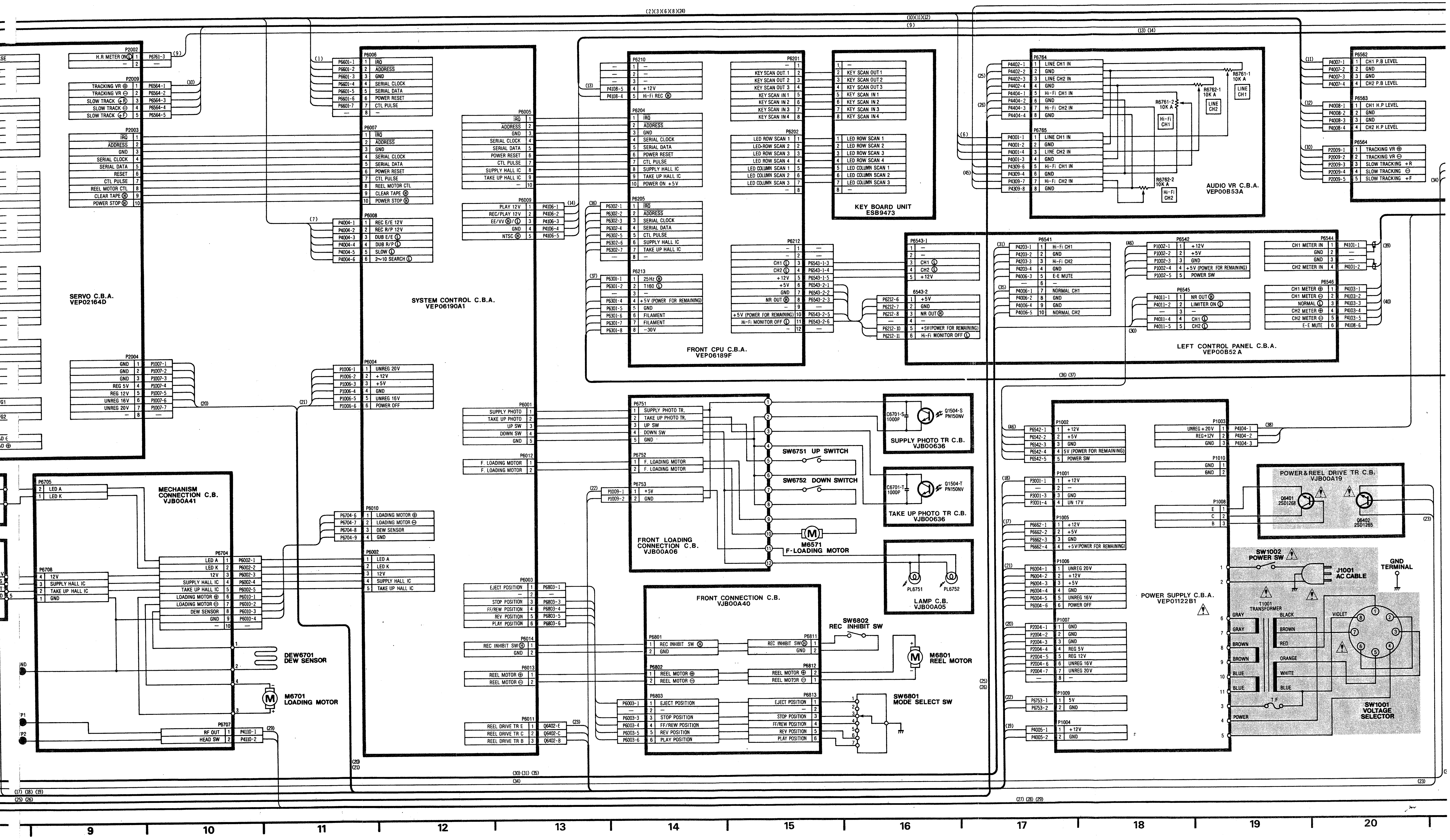
Rear View

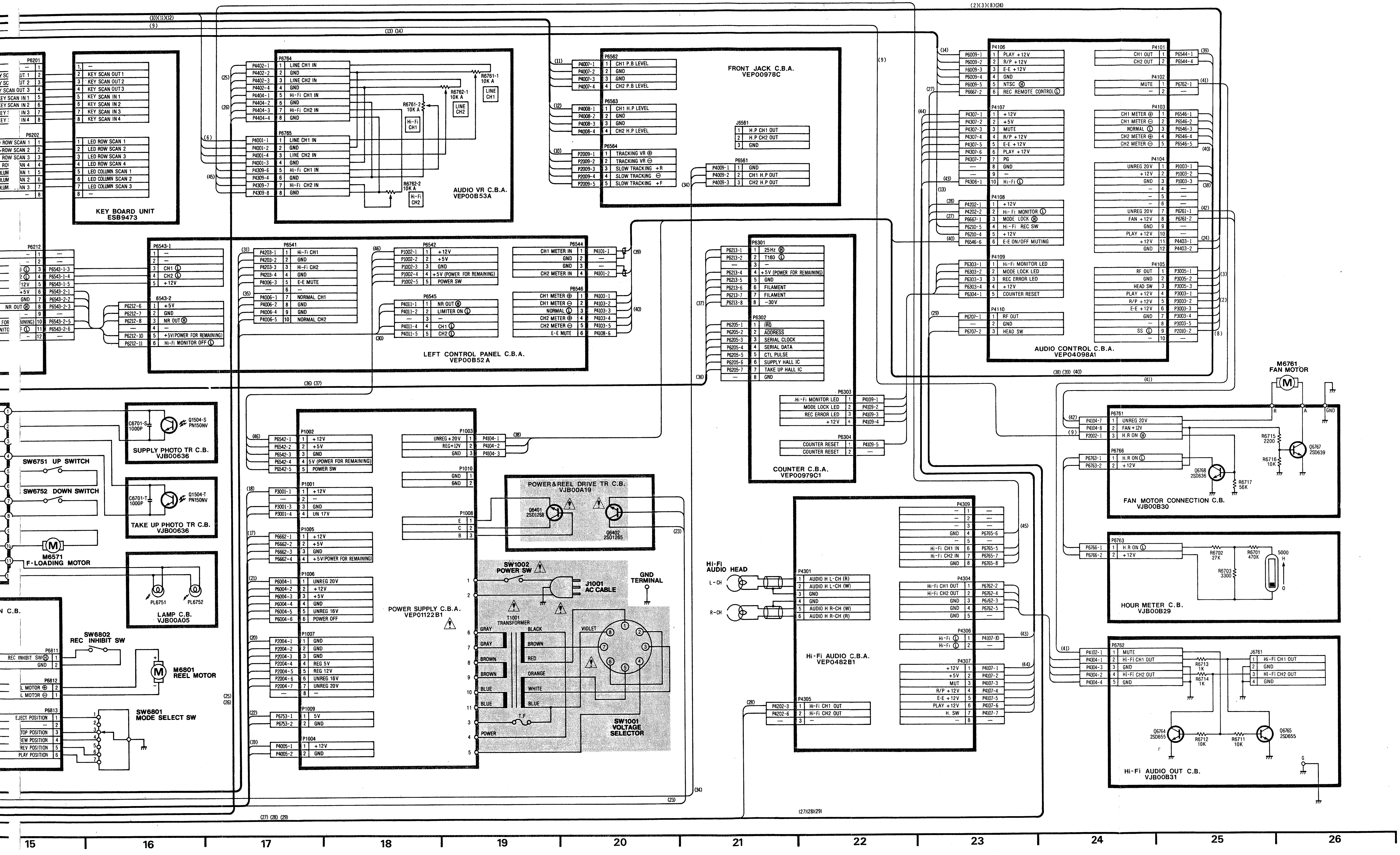

Power Supply C.B.A.
34P CONTROL C.B.A.
REAR JACK C.B.A.

INTERCONNECTION SCHEMATIC DIAGRAM



34P CONTROL C.B.A.
VEP00982A
REAR JACK C.B.A.
VEP00B58A
LUMINANCE & CHROMINANCE C.B.A. VEP03164E
AUDIO PRE-AMP C.B.A.
VEP04099A1
AUDIO (1) C.B.A.
VEP04093F
AUDIO (2) C.B.A.
VEP04094F
Hi-Fi / NORMAL SELECT C.B.A.
VEP04097A
SERVO C.B.A.
VEP02164D
SENSOR LED C.B.A.
VJB00639
REEL SENSOR C.B.
VJB00931
MECHANISM CONNECTION C.B.
VJB00A41
SYSTEM CO
VEP061
AUDIO HEAD
VIDEO HEAD
AUDIO ERASE HEAD
FULL ERASE HEAD
CONTROL HEAD
CYLINDER MOTOR
CAPSTAN MOTOR
DEW6701
DEW SENSOR
M6701
LOADING MOTOR
D6702
D6701
LN56×2
IC6702
DN6838×2
IC6701
GND
TP1
TP2
CH1
CH2
J6601
P6501
P6602
J6661
P6661
P6662
P6663
P6664
P6665
P6666
P6667
P6668
P3003
P3005
P8302
P3007
P3008
P3004
P3006
P3001
P4401
P4402
P4403
P4404
P4001
P4002
P4003
P4004
P4005
P4012
P4013
P4014
P4010
P4009
P4015
P4016
P4006
P4007
P4008
P4011
P4201
P4204
P4203
P4202
P2010
P2001
P001
P2005
P2006
P2012
P2008
P2002
P2009
P2003
P2004
P6705
P6708
P6704
P6707
P6006
P6007
P6008
P6004
P6010
P6002
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12


SERVO C.B.A.
VEP02164D
SYSTEM CONTROL C.B.A.
VEP06190A1
FRONT CPU C.B.A.
VEP06189F
KEY BOARD UNIT
ESB9473
AUDIO VR C.B.A.
VEP00B53A
LEFT CONTROL PANEL C.B.A.
VEP00B52A
MECHANISM CONNECTION C.B.
VJB00A41
FRONT LOADING CONNECTION C.B.
VJB00A06
FRONT CONNECTION C.B.
VJB00A40
SUPPLY PHOTO TR C.B.
VJB00636
TAKE UP PHOTO TR C.B.
VJB00636
LAMP C.B.
VJB00A05
POWER SUPPLY C.B.A.
VEP01122B1
POWER&REEL DRIVE TR C.B.
VJB00A19
SW6751 UP SWITCH
SW6752 DOWN SWITCH
M6571
F-LOADING MOTOR
SW6802
REC INHIBIT SW
M6801
REEL MOTOR
SW6801
MODE SELECT SW
DEW6701
DEW SENSOR
M6701
LOADING MOTOR
SW1002
POWER SW
J1001
AC CABLE
GND
TERMINAL
T1001
TRANSFORMER
SW1001
VOLTAGE
SELECTOR
Q1504-S
PN150NV
Q1504-T
PN150NV
Q6401
2SD1268
Q6402
2SD1265
PL6751
PL6752
C6701-S
1000P
C6701-T
1000P
R6761-1
10K A
R6761-2
10K A
R6762-1
10K A
R6762-2
10K A
LINE CH1
LINE CH2
Hi-Fi CH1
Hi-Fi CH2
P2002
H.R METER ON
P2009
TRACKING VR ⊕
TRACKING VR ⊖
SLOW TRACK ⊕R
SLOW TRACK ⊖
SLOW TRACK ⊕F
P2003
IRQ
ADDRESS
GND
SERIAL CLOCK
SERIAL DATA
RESET
CTL PULSE
REEL MOTOR CTL
CLEAR TAPE Ⓗ
POWER STOP Ⓗ
P2004
GND
REG 5V
REG 12V
UNREG 16V
UNREG 20V
P6006
P6007
POWER RESET
P6008
REC E/E 12V
REC R/P 12V
DUB E/E Ⓛ
DUB R/P Ⓛ
SLOW Ⓛ
2~10 SEARCH Ⓛ
P6004
UNREG 20V
+12V
+5V
UNREG 16V
POWER OFF
P6005
SUPPLY HALL IC
TAKE UP HALL IC
P6009
PLAY 12V
REC/PLAY 12V
EE/VV Ⓗ/Ⓛ
NTSC Ⓗ
P6001
SUPPLY PHOTO
TAKE UP PHOTO
UP SW
DOWN SW
P6012
F. LOADING MOTOR
P6010
LOADING MOTOR ⊕
LOADING MOTOR ⊖
DEW SENSOR
P6002
LED A
LED K
12V
P6003
EJECT POSITION
STOP POSITION
FF/REW POSITION
REV POSITION
PLAY POSITION
P6014
REC INHIBIT SW Ⓗ
P6013
REEL MOTOR ⊕
REEL MOTOR ⊖
P6011
REEL DRIVE TR E
REEL DRIVE TR C
REEL DRIVE TR B
P6705
P6708
P6704
P6707
RF OUT
HEAD SW
P6210
Hi-Fi REC Ⓗ
P6204
POWER ON +5V
P6205
P6213
25Hz Ⓗ
T160 Ⓛ
+5V (POWER FOR REMAINING)
FILAMENT
−30V
P6201
KEY SCAN OUT 1
KEY SCAN OUT 2
KEY SCAN OUT 3
KEY SCAN IN 1
KEY SCAN IN 2
KEY SCAN IN 3
KEY SCAN IN 4
P6202
LED ROW SCAN 1
LED ROW SCAN 2
LED ROW SCAN 3
LED ROW SCAN 4
LED COLUMN SCAN 1
LED COLUMN SCAN 2
LED COLUMN SCAN 3
P6212
CH1 Ⓛ
CH2 Ⓛ
NR OUT Ⓗ
Hi-Fi MONITOR OFF Ⓛ
P6543-1
P6543-2
P6751
SUPPLY PHOTO TR.
TAKE UP PHOTO TR.
P6752
P6753
P6801
P6811
P6802
P6812
P6803
P6813
P6764
P6765
LINE CH1 IN
LINE CH2 IN
Hi-Fi CH1 IN
Hi-Fi CH2 IN
P6562
CH1 P.B LEVEL
CH2 P.B LEVEL
P6563
CH1 H.P LEVEL
CH2 H.P LEVEL
P6564
SLOW TRACKING +R
SLOW TRACKING ⊖
SLOW TRACKING +F
P6541
Hi-Fi CH1
Hi-Fi CH2
E-E MUTE
NORMAL CH1
NORMAL CH2
P6542
POWER SW
P6545
LIMITER ON Ⓛ
P6544
CH1 METER IN
CH2 METER IN
P6546
CH1 METER ⊕
CH1 METER ⊖
NORMAL Ⓛ
CH2 METER ⊕
CH2 METER ⊖
E-E MUTE
P1002
5V (POWER FOR REMAINING)
P1001
UN 17V
P1005
P1006
P1007
P1009
P1004
P1003
UNREG +20V
REG+12V
P1010
P1008
GRAY
BROWN
BLUE
POWER
BLACK
RED
ORANGE
WHITE
VIOLET
T.F
(2)(3)(6)(8)(24)
(10)(11)(12)
(9)
(13) (14)
(30) (31) (35)
(34)
(36) (37)
(27) (28) (29)
(17) (18) (19)
(25) (26)
(20)(21)
9
10
11
12
13
14
15
16
17
18
19
20


KEY BOARD UNIT
ESB9473
P6201
P6202
KEY SCAN OUT 1
KEY SCAN OUT 2
KEY SCAN OUT 3
KEY SCAN IN 1
KEY SCAN IN 2
KEY SCAN IN 3
KEY SCAN IN 4
LED ROW SCAN 1
LED ROW SCAN 2
LED ROW SCAN 3
LED ROW SCAN 4
LED COLUMN SCAN 1
LED COLUMN SCAN 2
LED COLUMN SCAN 3
AUDIO VR C.B.A.
VEP00B53A
P6764
P6765
LINE CH1 IN
LINE CH2 IN
Hi-Fi CH1 IN
Hi-Fi CH2 IN
R6761-1
10K A
R6761-2
10K A
R6762-1
10K A
R6762-2
10K A
LINE CH1
LINE CH2
Hi-Fi CH1
Hi-Fi CH2
FRONT JACK C.B.A.
VEP00978C
P6562
CH1 P.B LEVEL
CH2 P.B LEVEL
P6563
CH1 H.P LEVEL
CH2 H.P LEVEL
P6564
TRACKING VR ⊕
TRACKING VR ⊖
SLOW TRACKING +R
SLOW TRACKING ⊖
SLOW TRACKING +F
J6561
H.P CH1 OUT
H.P CH2 OUT
P6561
CH1 H.P OUT
CH2 H.P OUT
AUDIO CONTROL C.B.A.
VEP04098A1
P4106
PLAY +12V
R/P +12V
E-E +12V
NTSC Ⓗ
REC REMOTE CONTROL Ⓛ
P4107
MUTE
PG
Hi-Fi Ⓛ
P4108
Hi-Fi MONITOR Ⓛ
MODE LOCK Ⓗ
Hi-Fi REC SW
E-E ON/OFF MUTING
P4109
Hi-Fi MONITOR LED
MODE LOCK LED
REC ERROR LED
COUNTER RESET
P4110
RF OUT
HEAD SW
P4101
CH1 OUT
CH2 OUT
P4102
P4103
CH1 METER ⊕
CH1 METER ⊖
NORMAL Ⓛ
CH2 METER ⊕
CH2 METER ⊖
P4104
UNREG 20V
FAN +12V
P4105
SS Ⓛ
LEFT CONTROL PANEL C.B.A.
VEP00B52A
P6543-1
P6212
P6541
P6542
P6544
P6545
P6546
+5V (POWER FOR REMAINING)
POWER SW
NR OUT Ⓗ
LIMITER ON Ⓛ
NORMAL CH1
NORMAL CH2
E-E MUTE
Hi-Fi MONITOR OFF Ⓛ
COUNTER C.B.A.
VEP00979C1
P6301
25Hz Ⓗ
T160 Ⓛ
FILAMENT
-30V
P6302
IRQ
ADDRESS
SERIAL CLOCK
SERIAL DATA
CTL PULSE
SUPPLY HALL IC
TAKE UP HALL IC
P6303
P6304
COUNTER RESET
SUPPLY PHOTO TR C.B.
VJB00636
C6701-S 1000P
Q1504-S PN150NV
SW6751 UP SWITCH
SW6752 DOWN SWITCH
TAKE UP PHOTO TR C.B.
VJB00636
C6701-T 1000P
Q1504-T PN150NV
M6571
F-LOADING MOTOR
LAMP C.B.
VJB00A05
PL6751
PL6752
SW6802
REC INHIBIT SW
M6801
REEL MOTOR
SW6801
MODE SELECT SW
P6811
P6812
P6813
REC INHIBIT SW
EJECT POSITION
TOP POSITION
REW POSITION
REV POSITION
PLAY POSITION
POWER SUPPLY C.B.A.
VEP01122B1
P1002
P1001
UN 17V
P1005
P1006
UNREG 20V
REG 16V
POWER OFF
P1007
REG 5V
REG 12V
UNREG 16V
P1009
P1004
P1003
P1010
P1008
POWER & REEL DRIVE TR C.B.
VJB00A19
Q6401 2SD1268
Q6402 2SD1265
SW1002
POWER SW
J1001
AC CABLE
GND TERMINAL
T1001
TRANSFORMER
GRAY
BROWN
BLUE
BLACK
RED
ORANGE
WHITE
VIOLET
POWER
T.F
SW1001
VOLTAGE SELECTOR
Hi-Fi AUDIO HEAD
L-CH
R-CH
Hi-Fi AUDIO C.B.A.
VEP0482B1
P4301
AUDIO H L-CH (R)
AUDIO H L-CH (W)
AUDIO H R-CH (W)
AUDIO H R-CH (R)
P4309
P4304
P4306
P4307
P4305
Hi-Fi CH1 OUT
Hi-Fi CH2 OUT
M6761
FAN MOTOR
FAN MOTOR CONNECTION C.B.
VJB00B30
P6761
P6766
H.R ON Ⓗ
H.R ON Ⓛ
R6715 2200
R6716 10K
R6717 56K
Q6767 2SD639
Q6768 2SD636
HOUR METER C.B.
VJB00B29
P6763
R6702 27K
R6701 470K
R6703 3300
5000 H
Hi-Fi AUDIO OUT C.B.
VJB00B31
P6762
J6761
R6713 1K
R6714 1K
R6712 10K
R6711 10K
Q6764 2SD655
Q6765 2SD655
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ORDER NO. VRD-8310-493

Service Manual

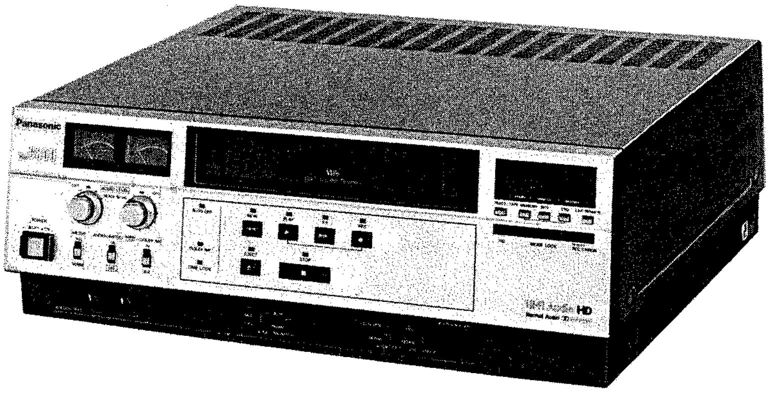
Video Cassette Recorder

Vol. 5

Panasonic
Omnivision II
VHS Hi-Fi

AG-6800

Exploded Views
Replacement Parts Lists



SPECIFICATIONS

Power Source;	110/120/220/240V AC, 60/50Hz
Power Consumption:	Approx. 60 watts
Television System:	EIA Standard (525 lines, 60 fields) NTSC color signal
Video Recording System:	2 rotary heads, helical scanning system Luminance: FM azimuth recording Color signal: converted subcarrier phase shift recording
Audio Tracks:	4 channels NORMAL (CH1/CH2): 2 fixed head tracks HD (CH1/CH2): 2 rotary head tracks
Tape Format:	Tape width 1/2 inch (12.7mm), high density tape
Tape Speed:	1-5/16 i.p.s. (33.35mm/s) (Normal)
Record/Playback Time:	120min. with NV-T120
FF/REW Time:	Less than 4.0min with NV-T120
Input Level:	Video: VIDEO IN (BNC), 1.0Vp-p, 75Ω Audio: LINE IN (RCA); NORMAL (CH1/CH2) −20dB (standard input −8dB), 47kΩ HD (CH1/CH2)
Output Level:	Video: TV Monitor (8 pins), 1.0Vp-p, 75Ω VIDEO OUT (BNC), 1.0Vp-p, 75Ω Audio: TV Monitor (8 pins), 0dB, 600Ω AUDIO OUT (RCA); NORMAL (CH1/CH2) −8dB, 1kΩ HD (CH1/CH2) HEADPHONES, −16dB ~ −60dB, 8Ω
Rec Remote:	(RCA)
Camera Remote:	(M2)
Video Horizontal Resolution:	Color: more than 240 lines B/W: more than 300 lines (on monoscope test pattern)
Audio Frequency Response:	50 ~ 12,000Hz (Normal Audio) 20 ~ 20,000Hz (HD Sound)
Signal-to-Noise Ratio:	Video: B/W: better than 46dB Color: better than 45dB (Shibasoku noise meter) Audio: better than 48dB (Normal Audio/ Dolby NR IN)
Audio Dynamic Range:	better than 80dB (HD Sound)
Wow and Flutter:	less than 0.005% (HD Sound)
Operating Temperature:	41°F ~ 104°F (5°C ~ 40°C)
Operating Humidity:	35% ~ 80%
Weight:	30.9 lbs (14.0kg)
Dimensions:	17″(W) × 15-1/2″(D) × 6-1/4″(H) 430(W) × 392(D) × 158(H)mm
Accessory Supplied:	1 pc. Dust cover

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

* Noise reduction manufactured under license from Dolby Laboratories Licencing Corporation.

Panasonic®

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Victoria Industrial Park
Carolina, Puerto Rico 00630

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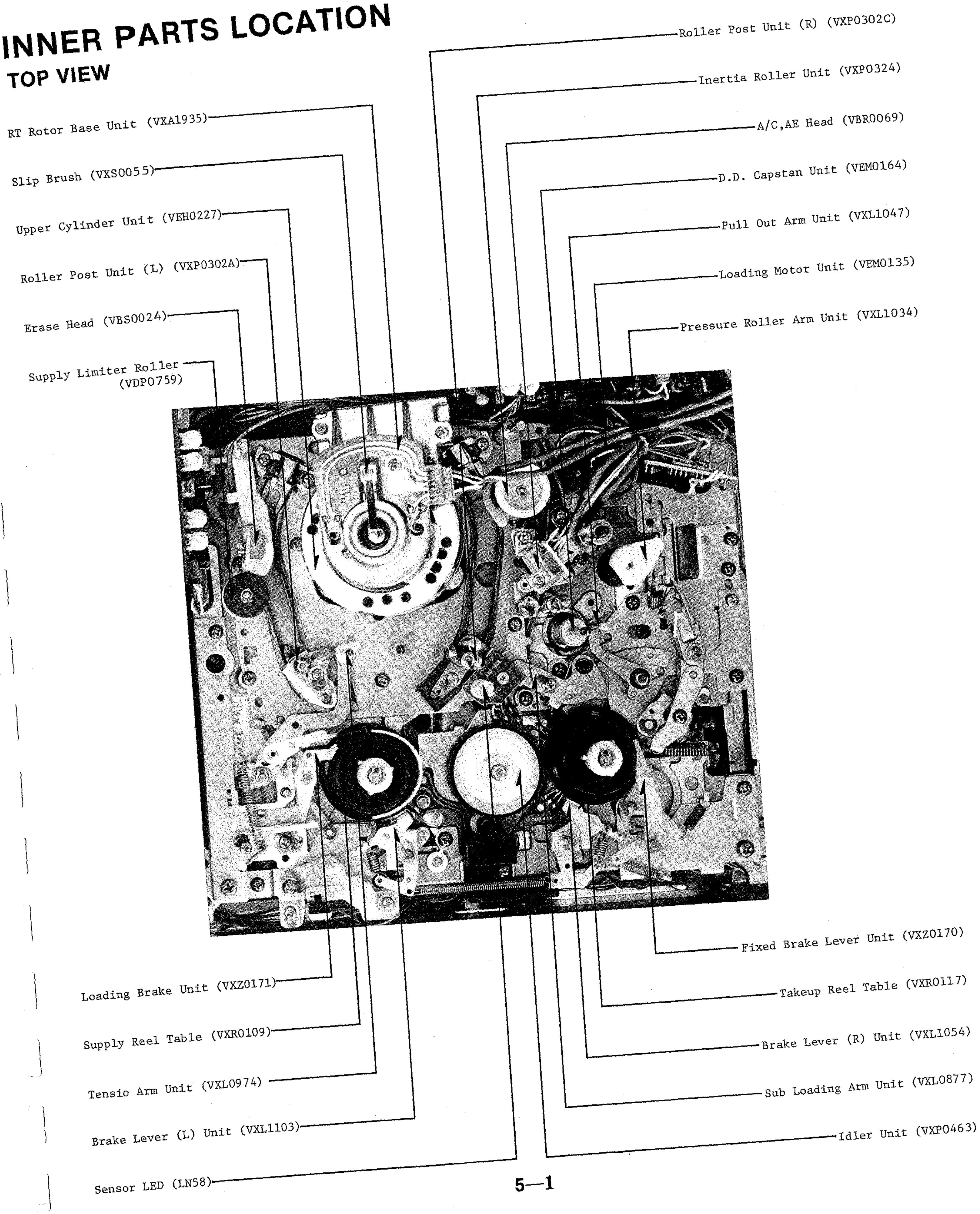
INNER PARTS LOCATION

TOP VIEW



RT Rotor Base Unit (VXA1935)

Slip Brush (VXS0055)

Upper Cylinder Unit (VEH0227)

Roller Post Unit (L) (VXP0302A)

Erase Head (VBS0024)

Supply Limiter Roller (VDP0759)

Loading Brake Unit (VXZ0171)

Supply Reel Table (VXR0109)

Tensio Arm Unit (VXL0974)

Brake Lever (L) Unit (VXL1103)

Sensor LED (LN58)

Roller Post Unit (R) (VXP0302C)

Inertia Roller Unit (VXP0324)

A/C,AE Head (VBR0069)

D.D. Capstan Unit (VEM0164)

Pull Out Arm Unit (VXL1047)

Loading Motor Unit (VEM0135)

Pressure Roller Arm Unit (VXL1034)

Fixed Brake Lever Unit (VXZ0170)

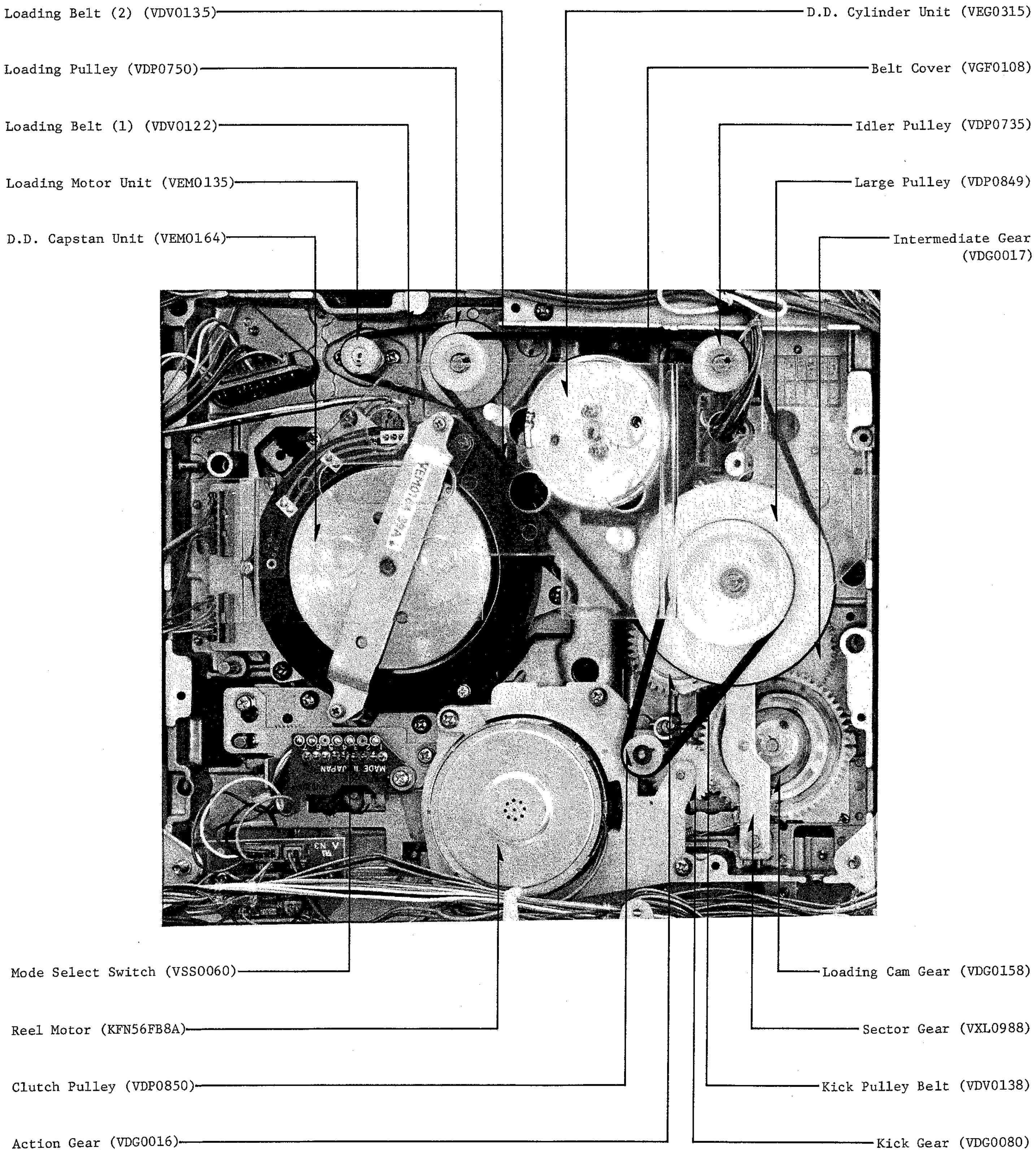
Takeup Reel Table (VXR0117)

Brake Lever (R) Unit (VXL1054)

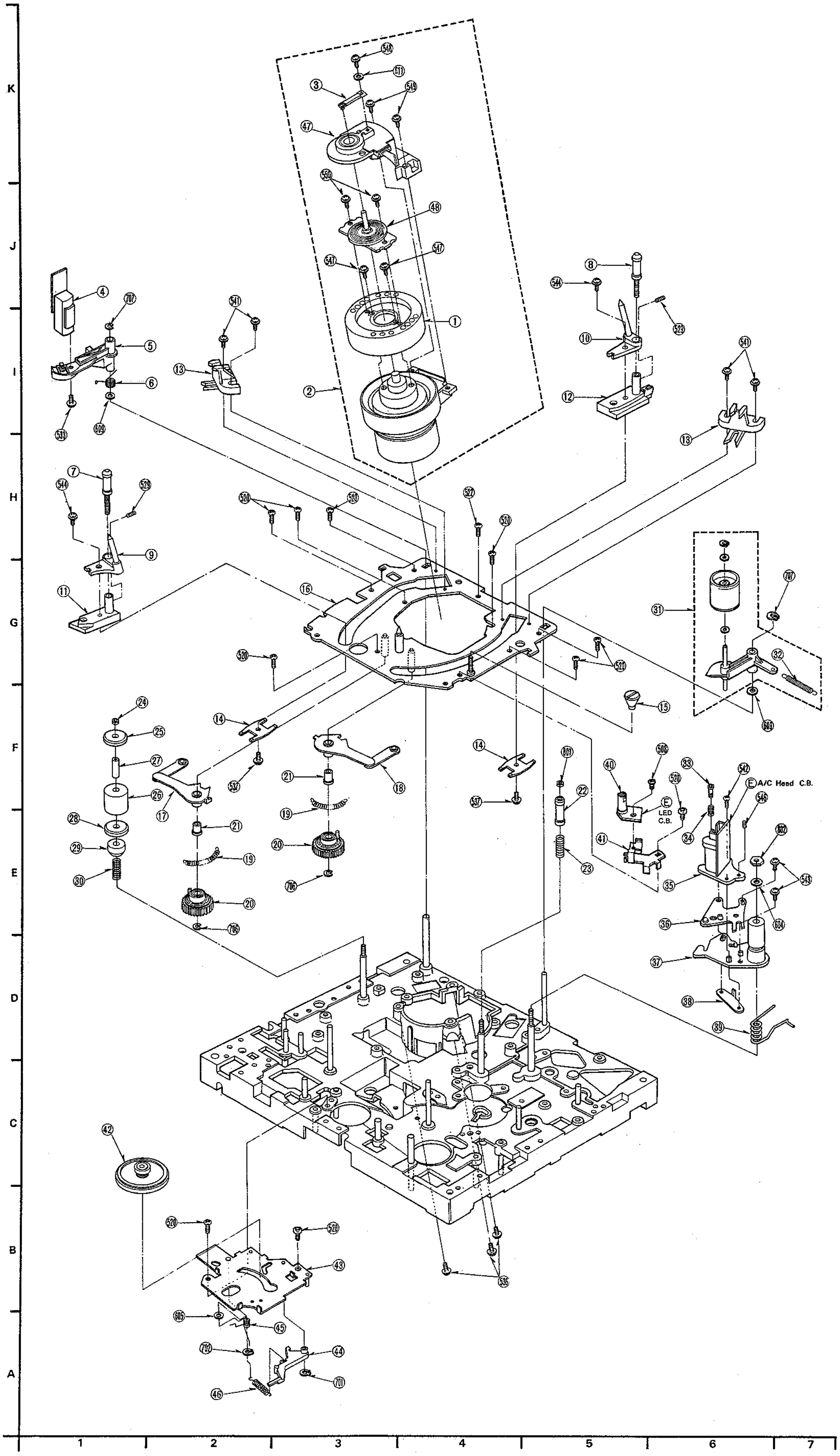
Sub Loading Arm Unit (VXL0877)

Idler Unit (VXP0463)

BOTTOM VIEW


Loading Belt (2) (VDV0135)
Loading Pulley (VDP0750)
Loading Belt (1) (VDV0122)
Loading Motor Unit (VEM0135)
D.D. Capstan Unit (VEM0164)
D.D. Cylinder Unit (VEG0315)
Belt Cover (VGF0108)
Idler Pulley (VDP0735)
Large Pulley (VDP0849)
Intermediate Gear (VDG0017)
Mode Select Switch (VSS0060)
Reel Motor (KFN56FB8A)
Clutch Pulley (VDP0850)
Action Gear (VDG0016)
Loading Cam Gear (VDG0158)
Sector Gear (VXL0988)
Kick Pulley Belt (VDV0138)
Kick Gear (VDG0080)

EXPLODED VIEWS ❶ *Transport Section*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E LED C.B.
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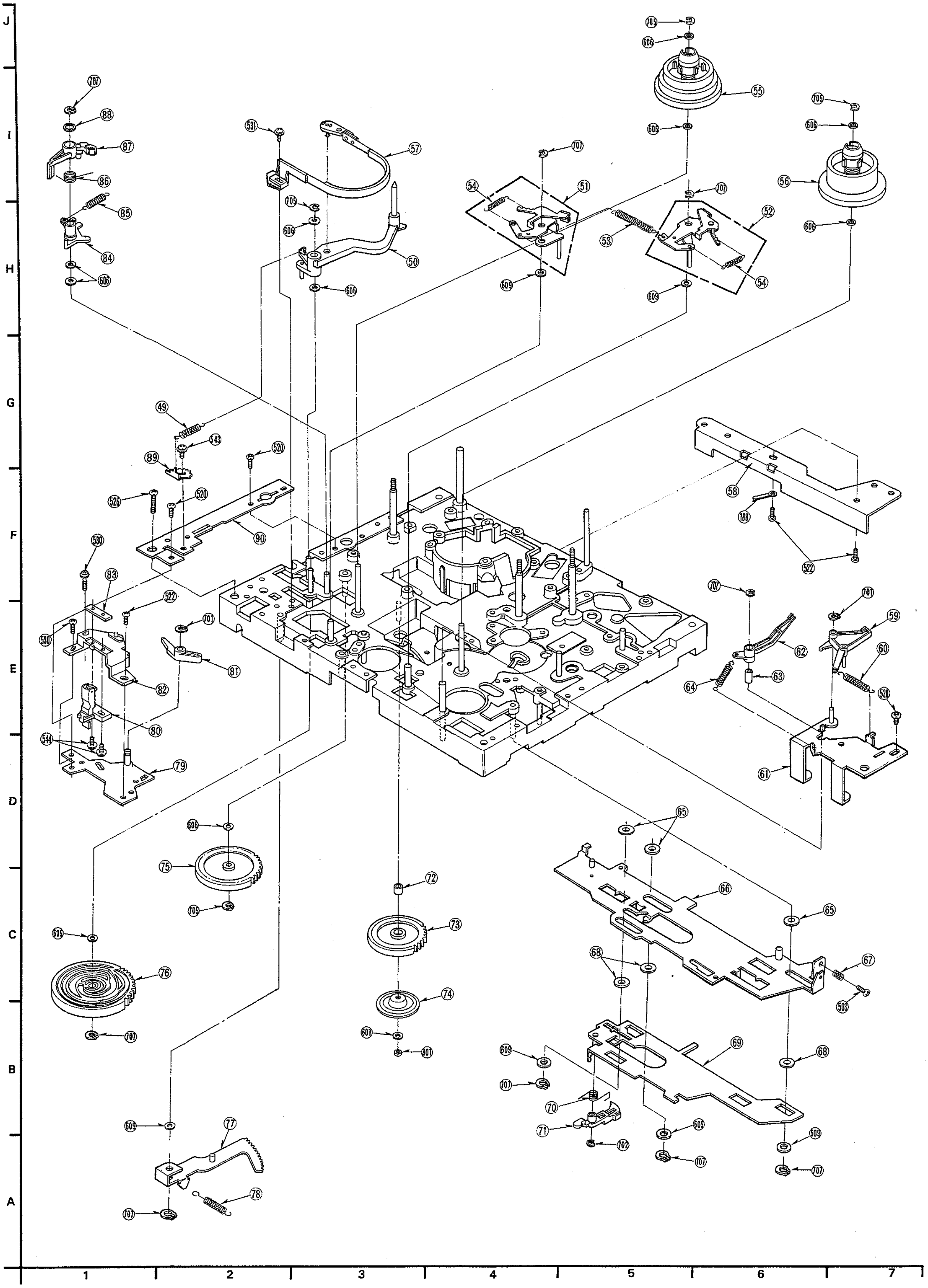
❷ Moving Mechanism Section-(1)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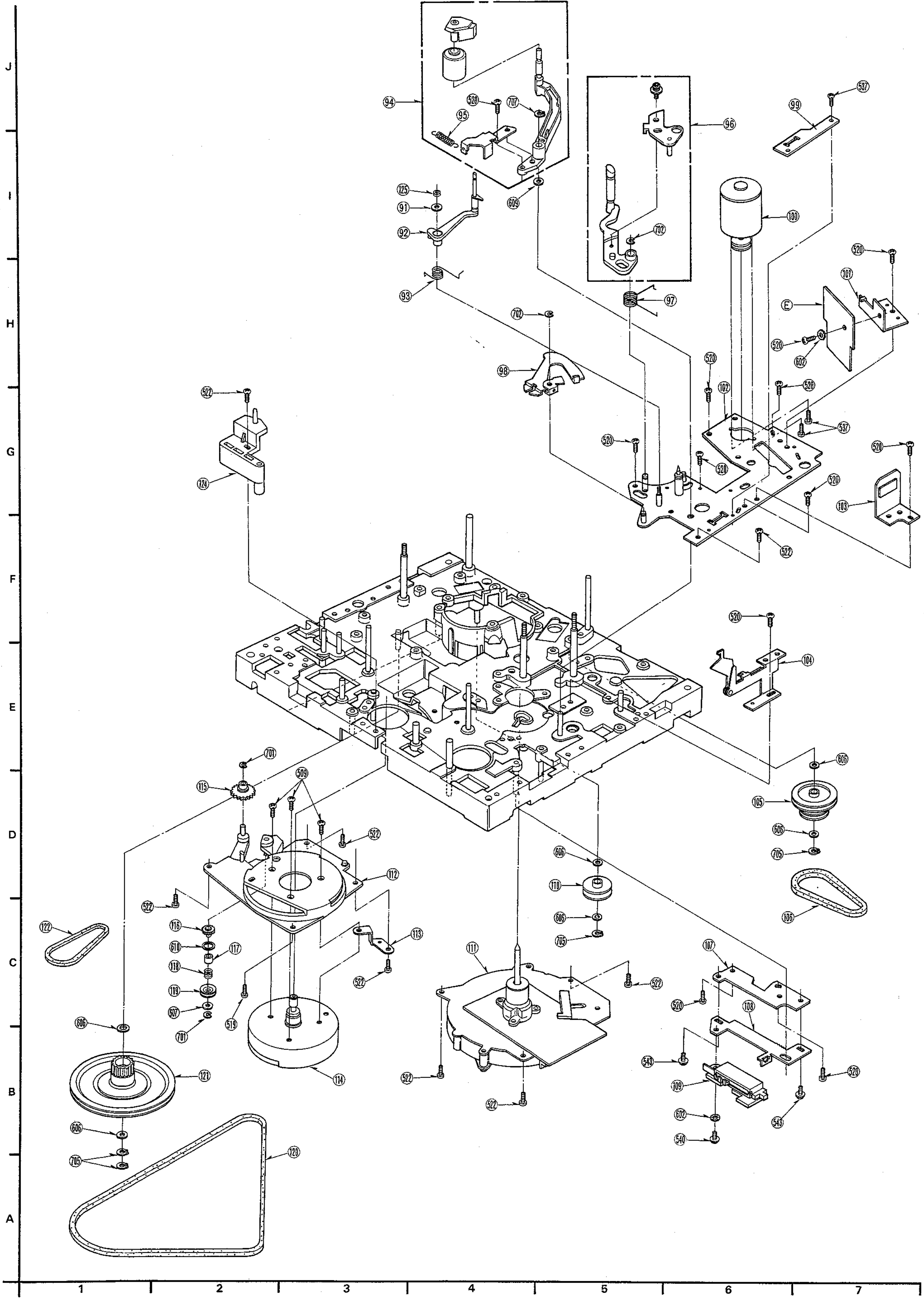
③ Moving Mechanism Section-(2)



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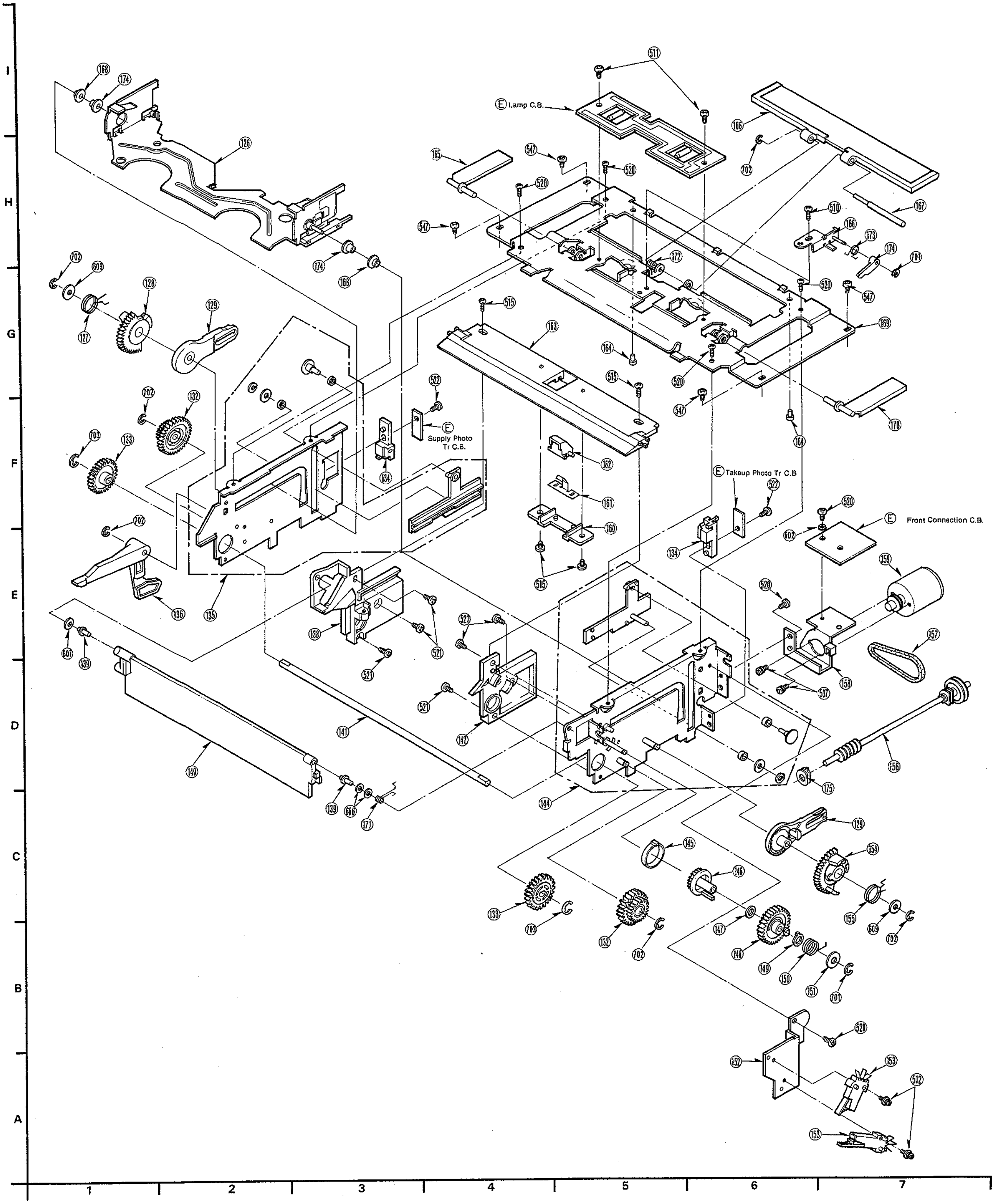
④ Front Loading Mechanism Section


Ⓔ Lamp C.B.
Ⓔ Supply Photo Tr C.B.
Ⓔ Takeup Photo Tr C.B
Ⓔ Front Connection C.B.
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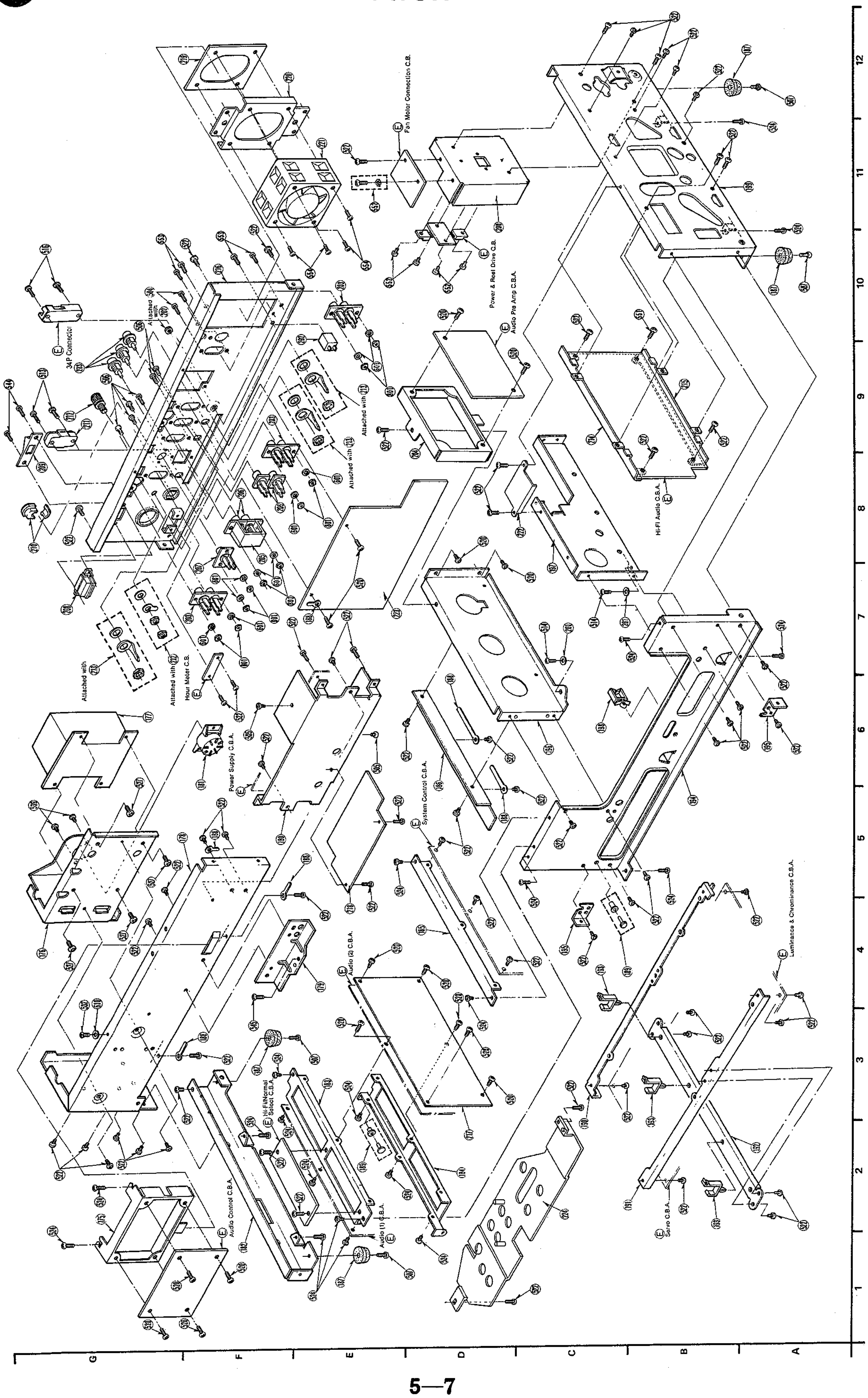
❺ *Chassis Frame Section*


Fan Motor Connection C.B.
Power & Reel Drive C.B.
Audio Pre Amp C.B.A.
34P Connector
Attached with
Hi-Fi Audio C.B.A.
Attached with
Hour Meter C.B.
Power Supply C.B.A.
System Control C.B.A.
Audio (2) C.B.A.
Hi-Fi/Normal Select C.B.A.
Audio (1) C.B.A.
Audio Control C.B.A.
Luminance & Chrominance C.B.A.
Servo C.B.A.
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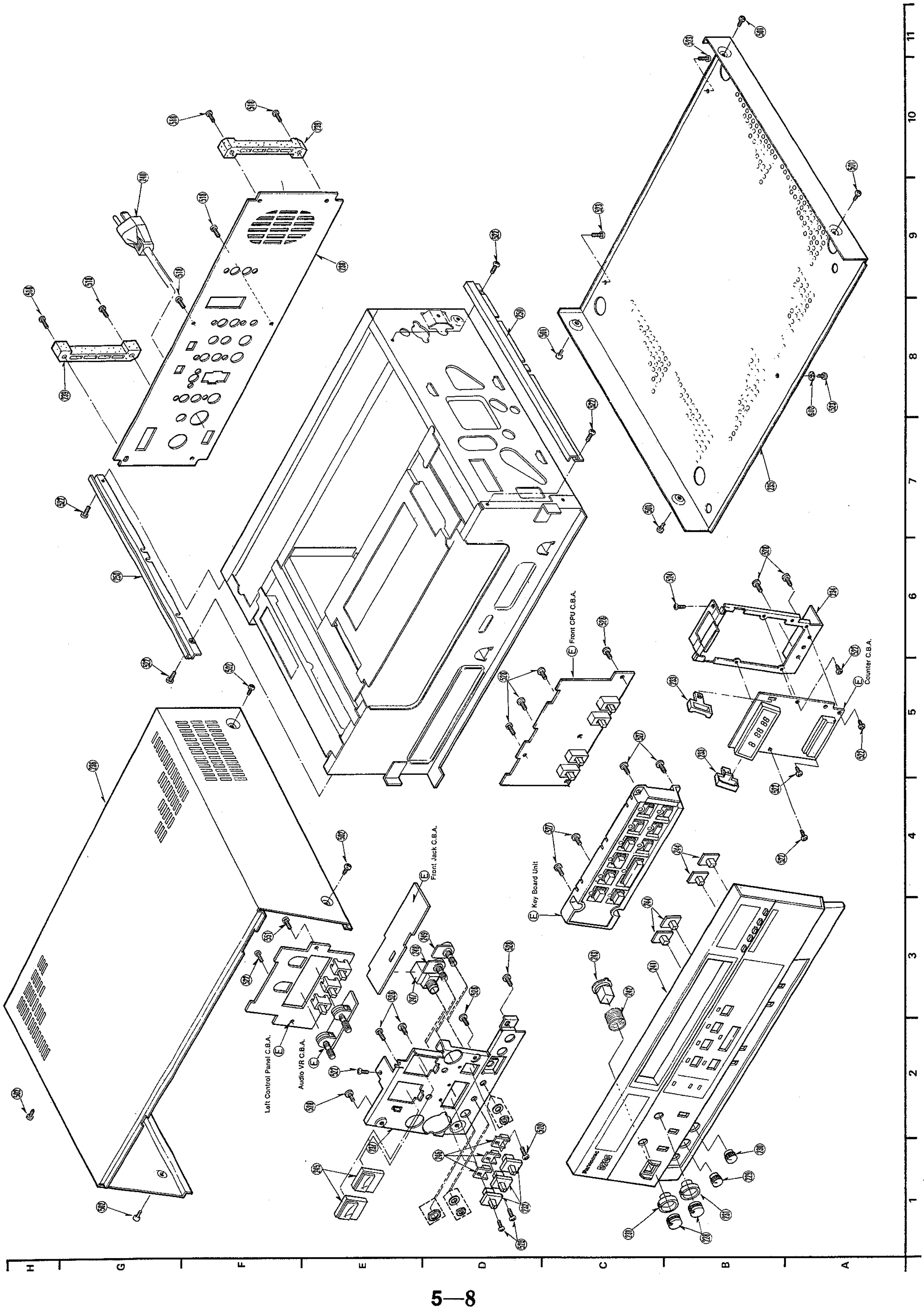
❻ Casing Parts Section


Front CPU C.B.A.
Counter C.B.A.
Key Board Unit
Front Jack C.B.A.
Left Control Panel C.B.A.
Audio VR C.B.A.
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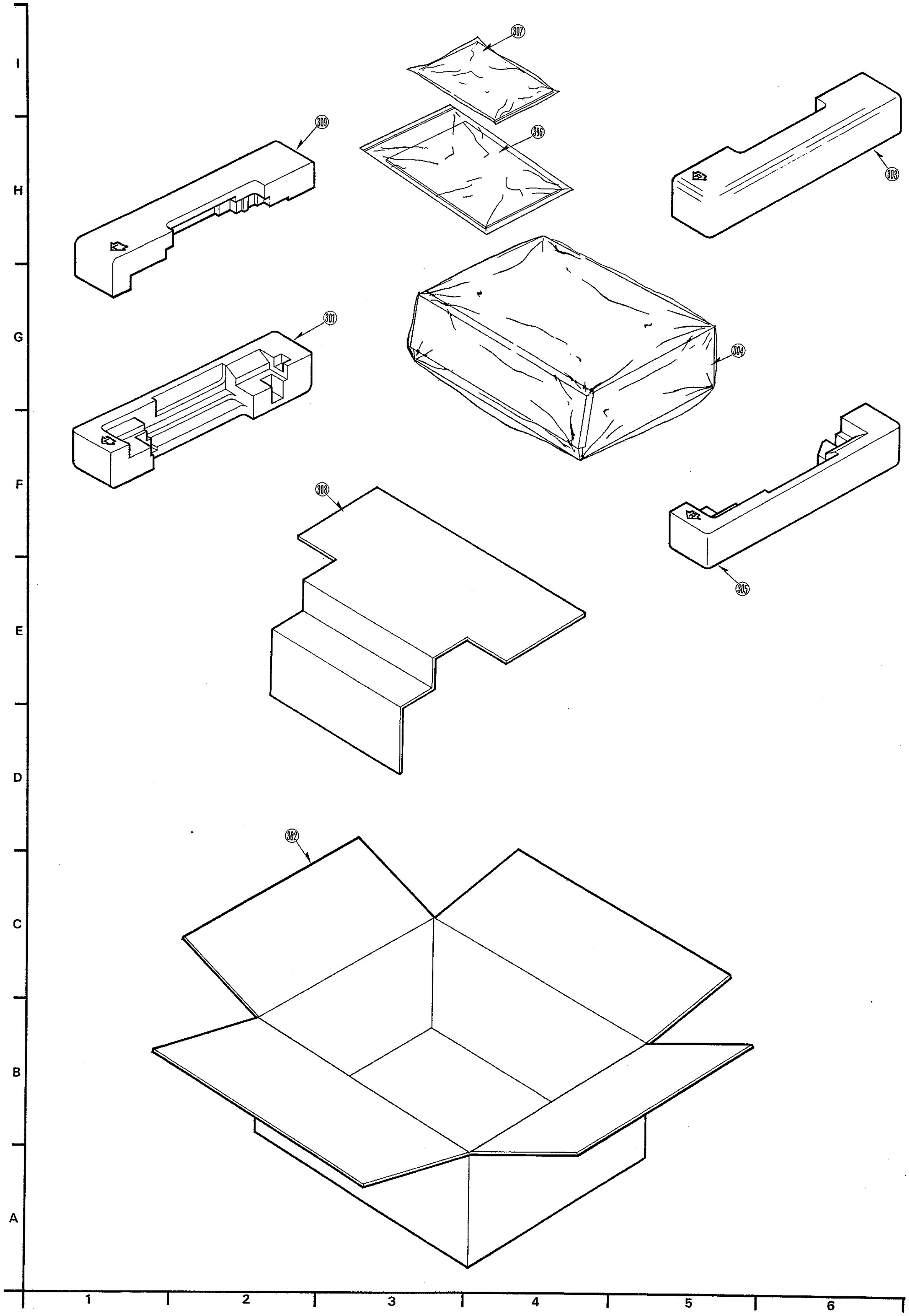
⑦ Packing Parts Section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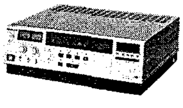
MECHANICAL REPLACEMENT PARTS LIST

Model No. AG-6800

Notes:
1. * Be sure to make your orders of replacement parts according to this list.
   * "Ⓝ" in Remarks column indicates new parts.
2. * "Ⓡ" in Remarks column indicates recommended parts.
3. IMPORTANT SAFETY NOTICE
   Components identified by ⚠ have special characteristics important for safety. When replacing any of these components, use only the original ones.



Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
1(1)		VEH0227	Upper Cylinder Unit	1	ⓃⓇ
2(1)		VEG0315	Cylinder Unit	1	ⓃⓇ
3(1)		VXS0055	Slip Brush	1	Ⓝ
4(1)		VBS0024	Erase Head	1	Ⓡ
5(1)		VML1370	Erase Head Lever	1	
6(1)		VMB1005	Erase Head Spring	1	
7(1)		VXP0302A	Roller Post Unit (L)	1	
8(1)		VXP0302C	Roller Post Unit (R)	1	
9(1)		VXA1191	Inclind Base (S) Unit	1	
10(1)		VXA1084	Inclind Base (B) Unit	1	
11(1)		VXA1189	Shaft Holder (S) Unit	1	
12(1)		VXA1333	Shaft Holder (T) Unit	1	
13(1)		VMD0100	Post Stopper	2	
14(1)		VMA4436	Shaft Holder Stopper (A)	2	
15(1)		VHN0014	"X" Adjust Nut	1	
16(1)		VXA1334	Loading Base (1) Unit	1	
17(1)		VXL0753	Loading Arm (L) Unit	1	
18(1)		VXL0861	Loading Arm (R) Unit	1	
19(1)		VMB0669	Loading Spring	2	
20(1)		VXP0505	Loading Gear Unit	2	
21(1)		VMX0257	Arm Sleeve	2	
22(1)		VMX0280	Post Sleeve	1	
23(1)		VMB0699	P4 Spring	1	
24(1)		VHD0045	Nut	1	
25(1)		VMX0297	Upper Limiter	1	
26(1)		VDP0759	Supply Roller	1	
27(1)		VMX0288	Collar	1	
28(1)		VMX0456	Lower Limiter (S)	1	
29(1)		VMX0571	Lower Limiter Roller	1	
30(1)		VMB0754	Supply Limiter Spring	1	
31(1)		VXP0324	Inertia Roller Unit	1	
32(1)		VMB0667	Inertia Roller Spring	1	
33(1)		VHD0054	Adjust Screw, A/C Head	1	
34(1)		VMB0404	Adjust Spring, A/C Head	1	
35(1)		VBR0069	A/C Head	1	Ⓡ
36(1)		VXA1990	A/C Head Base Unit	1	
37(1)		VXA1438	A/C Head Base (B) Unit	1	
38(1)		VMA4289	Bar Nut	1	
39(1)		VMB0997	A/C Head Height Spring	1	
40(1)		VMD0145	LED Holder	1	
41(1)		VMA4795	LED Holder Angle	1	
42(1)		VXP0463	Idler Unit	1	Ⓡ
43(1)		VXA1895	Reel Sensor Base (1) Unit	1	
44(1)		VML1433	Idler Stopper Lever	1	
45(1)		VMB1083	Idler Spring	1	
46(1)		VMB0882	Idler Stopper Spring	1	
47(1)		VXA1947	Stator Angle Unit	1	Ⓝ
48(1)		VXA1935	RT Rotor Base Unit	1	Ⓝ
49(2)		VMB1114	Tension Spring	1	
50(2)		VXL0974	Tension Arm Unit	1	
51(2)		VXL1103	Brake Lever (L) Unit	1	
52(2)		VXL1054	Brake Lever (R) Unit	1	
53(2)		VMB0661	Brake Spring	1	
54(2)		VMB0660	Brake Arm Spring	2	
55(2)		VXR0109	Supply Reel Table Unit	1	Ⓡ
56(2)		VXR0117	Takeup Reel Table Unit	1	Ⓡ
57(2)		VXZ0129	Tension Band Unit	1	Ⓡ
58(2)		VMA4406	Chassis Bracket	1	
59(2)		VXL0873	Soft Brake (T) Unit	1	
60(2)		VMB1211	Soft Brake Spring	1	
61(2)		VXA1855	Position Plate	1	
			(Rear, Right)		
62(2)		VXZ0170	Fixed Tension Brake Unit	1	
63(2)		VMX0367	Fixed Brake Sleeve	1	
64(2)		VMB0886	Fixed Brake Spring	1	
65(2)		VMX0308	Slide Washer	3	
66(2)		VXL1104	Main Lever (1) Unit	1	
67(2)		VMB0680	Adjust Spring	1	
68(2)		VMX0471	Slide Washer	3	
69(2)		VXL1106	Sub Lever (1) Unit	1	
70(2)		VMB0890	Kick Lever Spring	1	
71(2)		VML1432	Kick Lever	1	
72(2)		VMX0268	Action Gear Sleeve	1	
73(2)		VDG0016	Action Gear	1	
74(2)		VMA4088	Action Gear Holder	1	
75(2)		VDG0017	Intermediate Gear	1	
76(2)		VDG0159	Cam Gear	1	
77(2)		VXL0988	Sector Gear	1	
78(2)		VMB0860	Sub Lever Spring	1	
79(2)		VXA1934	Brake Release Base Unit	1	
80(2)		VSM0043	Safety Tab Switch	1	Ⓡ
81(2)		VXL0875	Soft Brake Release Unit	1	
82(2)		VMA6302	Cassette Support Angle	1	
83(2)		VMA5372	Nut Plate	1	
84(2)		VML1258	Soft Brake Lever A	1	
85(2)		VMB0885	Soft Brake Spring	1	
86(2)		VMB1210	Soft Brake Coil Spring	1	
87(2)		VXZ0110	Loading Brake Arm Unit	1	
88(2)		VMX0249	Soft Brake Stopper	1	
89(2)		VMA5813	Adjust Hook	1	
90(2)		VMA6052	Position Plate	1	
91(3)		VMX0558	P5 Washer	1	
92(3)		VXL1047	Pull Out Arm Unit	1	
93(3)		VMB0891	P5 Arm Spring	1	
94(3)		VXL1034	Pressure Roller Arm Unit	1	
95(3)		VMB0880	Pressure Roller Arm Spring	1	
96(3)		VXL0877	Sub Loading Arm Unit	1	
97(3)		VMB0889	Sub Loading Arm Spring	1	
98(3)		VML1554	Action Lever	1	
99(3)		VMA6224	Position Plate,	1	
			(Right, Front)		
100(3)		VEM0135	Loading Motor Unit	1	Ⓡ
101(3)		VMA6059	Wiring Board Angle	1	
102(3)		VXA1436	P5 Post Base Unit	1	
103(3)		VEK1293	Dew Sensor Unit	1	
104(3)		VXA1953	Opener Unit	1	
105(3)		VDP0735	Loading Intermediate	1	Ⓡ
			Pulley		
106(3)		VDV0122	Loading Belt (1)	1	Ⓡ
107(3)		VMA6057	Mode Select Switch Angle	1	
			(B)		
108(3)		VMA6056	Mode Select Switch Angle	1	
			(A)		
109(3)		VSS0060	Mode Select Switch	1	
110(3)		VDP0750	Idler Pulley	1	Ⓡ
111(3)		VEM0164	DD Capstan Motor	1	Ⓡ
112(3)		VXA1708	Reel Motor Bracket Unit	1	
113(3)		VMA6055	Earth Angle	1	
114(3)		KFN56FB8A	Reel Motor	1	Ⓡ
115(3)		VDG0080	Kick Gear	1	
116(3)		VDG0081	Clutch Gear	1	
117(3)		VMX0405	Clutch Collar	1	
118(3)		VMB0897	Clutch Spring	1	
119(3)		VDP0850	Clutch Pulley	1	Ⓡ

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
120(3)		VDV0135	Loading Betl (2)	1	®
121(3)		VDP0849	Loading Pulley	1	®
122(3)		VDV0138	Kick Pulley Belt	1	®
124(3)		VMD0442	Brake Release Bracket	1	
125(3)		VHN0023	Nylon Nut	1	
126(4)		VXA1789	Cassette Holder Unit	1	
127(4)		VMB1089	Wiper Spring (L)	1	
128(4)		VDG0115	Wiper Gear (L)	1	
129(4)		VML1436	Wiper Arm	2	
132(4)		VDG0120	Intermediate Gear	2	
133(4)		VDG0119	Shaft Gear	2	
134(4)		VMD0091	Photo Tr Holder.	2	
135(4)		VXA1793	Side Plate (L) Unit	1	
136(4)		VML1437	Front Opener Link	1	
138(4)		VMD0449	Front Guide (L)	1	
139(4)		VMS2350	Blinder Panel Shaft	2	
140(4)		VKF0222	Blinder Panel	1	®
141(4)		VMS2304	Main Shaft	1	
142(4)		VMD0459	Front Guide (R)	1	
144(4)		VXA1792	Side Plate (R) Unit	1	
145(4)		VMD0456	Stopper Ring	1	
146(4)		VDG0118	Clutch Gear	1	
147(4)		VMX0531	Clutch Spacer	1	
148(4)		VDG0117	Warm Wheel	1	
149(4)		VMD0566	Clutch Stopper	1	
150(4)		VMB1093	Clutch Spring	1	
151(4)		VMX0530	Clutch Washer	1	
152(4)		VMA6221	Switch Angle	1	
153(4)		VSM0046	Switch	2	®
154(4)		VDG0116	Wiper Gear (R)	1	
155(4)		VMB1090	Wiper Spring (R)	1	
156(4)		VXA1954	Pulley Shaft Unit	1	
157(4)		VDV0144	Loading Belt	1	®
158(4)		VMA6193	Front Loading Motor Panel	1	
159(4)		MXN12AE10C	Front Loading Motor	1	®
160(4)		VMD0454	Spring Holder	1	
161(4)		VMB1091	Safety Tab Spring	1	
162(4)		VMD0453	Safety Tab Knob	1	
163(4)		VMD0452	Cassette Guide	1	
164(4)		VMG0308	Cassette Stopper	2	
165(4)		VMD0492	Mirror Drive Panel (L)	1	
166(4)		VXA1795	Mirror Unit	1	
167(4)		VMS2342	Mirror Shaft	1	
168(4)		VDP0944	Wiper Roller (S)	2	
169(4)		VMA6197	Top Plate	1	
170(4)		VMD0491	Mirror Drive Panel (R)	1	
171(4)		VMB1171	Blinder Spring	1	
172(4)		VMB1125	Mirror Spring	1	
173(4)		VDB0660	Warm Shaft Bearing	1	
174(4)		VDP0918	Cassette Holder Roller (S)	2	
175(5)		VMP0406	C.B. Angle	1	🅝
176(5)		VMA6294	Power Transformer Angle	1	
177(5)		VTP0098	Power Transformer	1	⚠
178(5)		VMP0315	Center Frame (Side)	1	
179(5)		VMP0323	Chassis Angle	1	
180(5)		VSC0976	Heat Sink (A)	1	
181(5)		ESE37212	Voltage Selector	1	⚠
182(5)		VXA1932	Left Frame Unit	1	
183(5)		VMP0330	Audio Board Angle (T)	1	
184(5)		VMP0331	Audio Board Angle (B)	1	
185(5)		VMP0326	System Control Board	1	
			Angle (T)		
186(5)		VMP0327	System Control Board	1	
			Angle (B)		
187(5)		VMG0172	Rubber Cushion	4	
188(2,5)		VJR3	Clamper	7	
189(5)		VDB0358	Hook	2	
190(5)		VMP0318	Servo Board Angle (R)	1	
191(5)		VMP0316	Servo Board Angle (F)	1	
192(5)		VMP0317	Servo Board Angle (C)	1	
193(5)		VJF0045	Wire Clamper	3	
194(5)		VMP0322	Front Frame	1	
195(5)		VMP0312	Top Cover Angle	2	
196(5)		VMP0320	Center Frame (Left)	1	
197(5)		VMP0321	Center Frame (Right)	1	
198(5)		VJF0004	Wire Saddle	1	
199(5)		VXA2021	Right Frame Unit	1	🅝
200(5)		VSC1095	Heat Sink (B)	1	🅝
201(5)		VMX0508	Chassis Washer	2	
202(5)		VJJ0041	Camera Remote Connector	1	
203(5)		VJJ0081	Phone Jack (A)	3	
204(5)		VMP0413	C.B. Angle	1	🅝
205(5)		VMA5765	Jack Angle	1	
206(5)		VJJ0083	Phone Jack (C)	4	
207(5)		VJJ0082	Phone Jack (B)	1	
208(5)		EST15709V	Primary Power Switch	1	® ⚠
209(5)		VGF0093	Primary Switch Cover	1	
210(5)		VMP5027	AC Cord Bushing	1	® ⚠
211(5)		VJS1037	8P Connector	1	
212(5)		VJH0082	Terminal (GND)	1	
213(5)		VJS1087	BNC Connector	3	
214(5)		VMP0408	C.B. Angle (T)	1	🅝
215(5)		VMP0407	C.B. Angle (B)	1	🅝
216(5)		VMP0319	Rear Jack Angle	1	
217(5)		VSC0994	Shield Plate	1	
218(5)		VSC1114	Shield Plate	1	
219(5)		VMT0099	Fan Insulator	1	🅝
220(5)		VMP0405	Fan Angle	1	🅝
221(5)		EBP06B24L	Fan Motor	1	🅝
222(5)		VMP0409	Support Angle	1	🅝
223(5)		VMZ0570	Rear Jack Plate Cover	1	
224(5)		VGF0108	Chassis Bottom Cover	1	🅝
228(6)		VGT0227	Audio Level Knob (A)	2	
229(6)		VGT0131	Headphone Level Knob	1	
230(6)		VGT0131	Tracking Knob	1	
231(6)		VGU1189	Audio Level Knob (B)	2	🅝
232(6)		VGT0334	Slide Switch Knob (A)	3	
233(6)		VGQ0301	Display Tube Holder	2	
234(6)		VMP0314	Counter Board Angle	1	
235(6)		VKU0189	Bottom Cover	1	
236(6)		VYP0941	Top Cover	1	
237(6)		VMP0412	Left Control Board Angle	1	🅝
238(6)		VGH0144	Decorative Jack Panel	1	🅝
239(6)		VKA0034	Rubber Foot (B)	2	
240(6)		VJA0113	AC Power Cord	1	⚠
241(6)		VYP0917	Front Panel (1) Unit	1	🅝
242(6)		VMB0905	Buttom Spring (B)	1	
243(6)		VGU0272	Power Switch Button	1	
244(6)		VGT0335	Slide Switch Knob (B)	4	
245(6)		VSE0054	Audio Level Meter	2	🅝
246(6)		VGQ0559	Switch Angle	3	
247(6)		VJJ0094	Head Phone Jack	1	
248(6)		EWK1AK15B14	Head Phone VR	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
249(6)		EWK1AK15B15	Tracking VR	1	
250(6)		VXA2014	Support Angle	2	
301(7)		VPN0922	Cushion (Left, Bottom)	1	
302(7)		VPG1576	Packing Case	1	For U.S.A. Ⓝ
302(7)		VPG1554	Packing Case	1	For Canada Ⓝ
303(7)		VPN0919	Cushion (Right, Top)	1	
304(7)		VPF0114	Poly. Bag	1	
305(7)		VPN0921	Cushion (Right, Bottom)	1	
306(7)		VQF1151	Fan Bag	1	For U.S.A. Ⓝ
306(7)		VQF1178	Fan Bag	1	For Canada Ⓝ
307(7)		VFB0043	Dust Cover	1	
308(7)		VPN0942	Pad	1	
309(7)		VPN0920	Cushion (Left, Top)	1	
			Screws		
501(6)		XSN4+12BVS		4	
502(6)		XSBV0007		4	
503(2)		XSN3+10S		1	
504(5)		XSN3+6BVS		2	
505(5)		XSN3+8BNS		2	
506(5)		XSN3+8BVS		8	
507(5)		XSN4+16S		4	
508(1)		XSS26+4		1	
509(3)		XSS3+4S		3	
511(4)		XSN3+5S		2	
512(4)		XTN2+8S		2	
513(5)		XTN26+10S		2	
514(5)		XTN4+30S		2	
515(4)		XTS3+8JFZ		4	
516(5)		XTV26+8F		2	
517(3)		XTV3+10BFN		1	
518(5,6)		XTV3+10BFZ		8	
519(3)		XTV3+10J		1	
520(1,2,3,4,5)		XTV3+6BFN		35	
521(4)		XTV3+6BFN		6	
522(1,2,3,4		XTV3+8BFZ		115	
5,6)					
523(6)		XTV3+8FFZ		3	
524(5,6)		XTV3+8BFN		23	
525(6)		XTV3+8JZ		2	
526(2)		XTV4+30F		1	
527(5)		XTV4+10J		4	
528(6)		XTV4+8BFN		15	
529(1)		XXEV2D25FP		2	
530(2)		XYE3+BF18		1	
531(2)		XYE3+EF8		1	
532(5)		XYE4+EF6		1	
533(1)		XSN2+5	Screw	1	
533(1)		XWA2B	Spring Washer	1	
534(2)		XSN2+8	Screw	2	
534(2)		XWA2B	Spring Washer	2	
536(1)		XSN3+10S	Screw	3	
536(1)		XWA3B	Spring Washer	3	
537(1,3,4)		XSN3+4S	Screw	7	
537(1,3,4)		XWA3B	Spring Washer	7	
539(5)		XSN3+8S	Screw	2	
539(5)		XWA3B	Spring Washer	2	
540(3)		XSN3+10S	Screw	1	
540(3)		XWG3	Spring Washer	1	
541(1)		XSN3+12S	Screw	4	
541(1)		XWG3	Spring Washer	4	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
542(1)		XSN3+10S	Screw	1	
543(1,2,3)		XSN3+6S	Screw	5	
543(1,2,3)		XWA3B	Spring Washer	5	
543(1,2,3)		XWG3	Washer	5	
544(1,5)		XSN3+8S	Screw	6	
544(1,5)		XWA3B	Spring Washer	6	
544(1,5)		XWG3	Washer	6	
545(5)		XSN4+8S	Screw	1	
545(5)		XWA4B	Spring Washer	1	
546(1)		XXE3A8FDS		1	
547(1)		XYNV0002		2	
548(1)		XSN26+5	Screw	1	
548(1)		XWA26B	Washer	1	
549(1)		XYN3+B16		2	
550(1)		XYN3+A10BWS		2	
551(5,6)		XYE3+EF8		3	
552(5)		XTV3+8BFN		4	
553(5)		XTN3+8FFZ		4	
554(5)		XSB3+35		4	
			Washers		
601(2,5)		XWA3B		9	
602(3,4,6)		XWC3B		4	
604(1)		XWG4		1	
605(1)		XWGV4Y7G		1	
606(2,3,4)		XWGV3D6G		19	
607(3)		XWGV3D6G		1	
609(1,2,3,4)		XWGV4D9G		12	
610(3)		XWGV51F66G		1	
611(1)		XWG26		1	
			Retaining Rings		
702(1,2,3,4)		XUC3FP		11	
703(4)		XUC4FP		2	
705(2,3,4)		XUEV3VW		6	
706(1,4)		XUEV4VW		3	
707(1,2,3)		XUEV4VW		12	
			Nuts		
801(1,2,5)		XNG3ES		10	
802(1)		XNG4ES		1	

ELECTRICAL REPLACEMENT PARTS LIST

Model No. AG-6800

Notes:
1. * Be sure to make your orders of replacement parts according to this list.
   * "Ⓝ" in Remarks column indicates new parts.
2. * "Ⓡ" in Remarks column indicates recommended parts.
3. IMPORTANT SAFETY NOTICE
   Components identified by ⚠ have special characteristics important for safety.
   When replacing any of these components, use only the original ones.
4. Unless otherwise specified,
   All resistors are in OHMS (Ω), 1/4W ± 5% carbon. K=1,000Ω, M=1,000KΩ.
   All capacitors are in MICROFARADS (μF), ± 10% P=μμF.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VEP01122B1	Power Supply C.B.A.	1	
		VEP02164D	Servo C.B.A.	1	Ⓝ
		VEP03164E	Luminance & Chrominance C.B.A.	1	Ⓝ
		VEP06190A1	System Control C.B.A.	1	
		VEP04093F	Audio (1) C.B.A.	1	Ⓝ
		VEP04094F	Audio (2) C.B.A.	1	Ⓝ
		VEP06189F	Front CPU C.B.A.	1	Ⓝ
		VEP00979C1	Counter C.B.A.	1	Ⓝ
		VEP00982A	34P Control C.B.A.	1	
		VEP0482B1	Hi-Fi Audio C.B.A.	1	Ⓝ Ⓡ
		VEP04098A1	Audio Control C.B.A.	1	Ⓝ
		VEP04097A	Hi-Fi/Normal Select C.B.A.	1	Ⓝ
		VEP04099A1	Audio Pre-Amp C.B.A.	1	Ⓝ
		VJB00B52	Left Control Panel C.B.	1	Ⓝ
		VEP00B58A	Rear Jack C.B.A.	1	Ⓝ
		VJB00978	Front Jack C.B.	1	Ⓝ
		VJB00B53	Audio VR C.B.	1	Ⓝ
		VJB00B29	Hour Meter C.B.	1	Ⓝ
		VJB00B30	Fan Motor Connection C.B.	1	Ⓝ
		VJB00B31	Hi-Fi Audio Out C.B.	1	Ⓝ
		VJB00B79	20kHz LPF (A) C.B.	1	Ⓝ
		VJB00B80	20kHz LPF (B) C.B.	1	Ⓝ
		VJB00B81	Pre-Emphasis C.B.	1	Ⓝ
		VJB00A41	Mechanism Connection C.B.	1	
		VJB00A06	Front Loading Connection C.B.	1	
		VJB00A40	Front Connection C.B.	1	
		VJB00A05	Lamp C.B.	1	
		VJB00931	Reel Sensor C.B.	1	
		VJB00639	Sensor LED C.B.	1	
		VJB00636	Supply Photo TR C.B.	1	
		VJB00636	Take-up Photo TR C.B.	1	
		VJB00A19	Reel Drive & Power TR C.B	1	
		ESB9473	Key Board Unit	1	Ⓝ
		VTP0090	Power Transformer	1	Ⓡ ⚠
		ESE37212T	Voltage Selector	1	Ⓡ ⚠
		VJA0113	AC Cord	1	Ⓡ ⚠
		VJB00A72	A/C Head C.B.	1	
			Fuses		
F1001		XBA2C16NU0		1	Ⓡ ⚠
F1002		XBA1C25NU100		1	Ⓡ ⚠
F1003		XBA1C30NU100		1	Ⓡ ⚠
F1004		XBA1C20NU100		1	Ⓡ ⚠
		VEP01122B1	Power Supply C.B.A.		
			Transistors		
Q1001		2SC1383		1	(Q,R)
Q1002		2SB943		1	(Q,R) Ⓡ ⚠
Q1003,1004		2SD639		2	(Q,R)
Q1006		2SD639		1	(Q,R)
Q1007		2SB943		1	(Q,R) Ⓡ ⚠
Q1008,1009		2SD639		2	(Q,R)
Q1010		2SD636		1	(Q,R)
			Diodes		
D1001-1003		S4VB10		3	Ⓡ ⚠
D1004		RD5.6EB		1	Zener Ⓡ
D1005		RD2.7EB		1	Zener Ⓡ
D1006,1007		MA165		2	
D1008		RD16EB		1	Zener Ⓡ
D1009		RD6.2EB		1	Zener Ⓡ
D1010,1011		MA165		2	
D1012		RD33EB		1	Zener Ⓡ
D1013		8P2M	Thylister	1	Ⓡ
D1014,1015		MA165		2	
D1016		MA26T0		1	Ⓡ
			Resistors		
R1001		ERDS2TJ471	470	1	
R1002,1003		ERDS2TJ821	820	2	
R1004		ERDS2TJ101	100	1	
R1005		ERDS2TJ331	330	1	
R1006		EVN32CA00B52	Variable 500	1	Ⓡ

Servo C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R1007		ERDS2TJ391	390	1	
R1008		ERDS2TJ222	2.2K	1	
R1009		ERDS2TJ562	5.6K	1	
R1010		ERDS2TJ332	3.3K	1	
R1011,1012		ERDS2TJ152	1.5K	2	
R1013		ERDS2TJ182	1.8K	1	
R1014		ERDS2TJ122	1.2K	1	
R1015		EVN32CA00B52	Variable 500	1	®
R1016		ERDS2TJ152	1.5K	1	
R1017,1018		ERDS2TJ103	10K	2	
R1019		ERDS2TJ472	4.7K	1	
R1020		ERDS2TJ471	470	1	
			Capacitors		
C1002		ECET25R682	Electrolytic 25V 6800	1	
C1003,1004		ECET35R472	Electrolytic 35V 4700	2	
C1005		ECEA1AS221	Electrolytic 10V 220	1	
C1006		ECEA1CS101	Electrolytic 16V 100	1	
C1007		ECKF1H681KB	Ceramic 50V 680P	1	
C1008		ECKF1H103ZF	Ceramic 50V 0.01	1	
C1009		ECEA1AS221	Electrolytic 10V 220	1	
C1010		ECEA1HSR47	Electrolytic 50V 0.47	1	
C1011		ECEA1VS101	Electrolytic 35V 100	1	
C1012		ECEA1ES101	Electrolytic 25V 100	1	
C1013		ECKF1H681KB	Ceramic 50V 680P	1	
C1014		ECKF1H103ZF	Ceramic 50V 0.01	1	
C1015		ECEA1ES331	Electrolytic 25V 330	1	
C1016		ECEA1ES101	Electrolytic 25V 100	1	
C1017		ECEA1HS010	Electrolytic 50V 1	1	
			Coil		
L1001		VTQ0006	Line Filter	1	⚠
			Connectors		
P1001		VJP1231	4P	1	
P1002		VJP1232	5P	1	
P1003		VJP1230	3P	1	
P1004		VJP1229	2P	1	
P1005		VJP1231	4P	1	
P1006		VJP1233	6P	1	
P1007		VJP1235	8P	1	
P1008		VJP1230	3P	1	
P1009		VJP1229	2P	1	
P1010		VJP1141	2P	1	
			Test Terminals		
TP1001-1004		VJH23		4	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VEP02164D	Servo C.B.A.		
			Integrated Circuits		
IC2001		AN6357N		1	®
IC2002		AN6677		1	®
IC2003		AN6346N		1	®
IC2004		MN6168VIA		1	®
IC2005		AN640G		1	®
IC2006		μPD1511AC025		1	®
IC2007		μPD1511AC041		1	®
IC2008,2009		μPC358C		2	or NJM2904D ®
IC2011		μPD4066BC		1	®
IC2013		μPC339C		1	or AN6912, NJM2901 ®
IC2014		μPD4013BC		1	®
IC2016		μPD4528BC		1	®
IC2017		HD14538BP		1	®
IC2018		μPD4066BC		1	®
			Transistors		
Q2002		2SD636		1	(Q,R) ®
Q2003-2006		2SB641		4	(Q,R) ®
Q2007		2SD636		1	(Q,R)
Q2008-2010		2SD641		3	(Q,R)
Q2011		2SD636		1	(Q,R)
Q2012		2SB641		1	(Q,R)
Q2015		2SB641		1	(Q,R)
Q2016-2023		2SD636		8	(Q,R)
Q2025		2SD636		1	(Q,R)
Q2026		2SD637		1	(Q,R)
Q2027		2SB941		1	(P,Q)
Q2028		2SD637		1	(Q,R)
Q2029		2SB941		1	(P,Q)
Q2030		2SD637		1	(Q,R)
Q2032-2034		2SD1266		3	(P,Q)
Q2035,2036		2SD636		2	(Q,R)
Q2041		2SD636		1	(Q,R)
Q2042		2SC641		1	
Q2043		2SD636		1	(Q,R)
Q2044		2SC641		1	
Q2045		2SD636		1	(Q,R)
Q2047-2049		2SD636		3	(Q,R)
Q2050		2SB641		1	(Q,R)
Q2051-2053		2SD636		3	(Q,R)
Q2054		2SB641		1	(Q,R)
Q2056		2SD636		1	(Q,R)
Q2058		2SB641		1	(Q,R)
Q2060,2061		2SB641		2	(Q,R)
Q2062,2063		2SD636		2	(Q,R)
Q2065		2SD1266		1	(P,Q)
Q2068,2069		2SB641		2	(Q,R)
Q2075-2080		2SD636		6	(Q,R)
Q2086		2SD636		1	(Q,R)
Q2091		2SB641		1	(Q,R)
Q2031		2SB941		1	(P,Q)
			Diodes		
D2003,2004		MA165		2	
D2006		RD7.5EB	Zener	1	
D2009,2010		MA165		2	
D2012		MA165		1	
D2013-2015		10E1		3	
D2020,2021		MA165		2	
D2022		RD6.2EB		1	or MA1062M
D2023,2024		MA165		2	
D2026-2028		MA165		3	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
D2030-2036		MA165		7	
D2039		MA165		1	
D2043-2063		MA165		20	
			Resistors		
R2001		EUM38GAO0B54	Variable 50K	1	
R2002		ERDS2TJ124	120K	1	
R2006		ERDS2TJ103	10K	1	
R2007		ERDS2TJ562	5.6K	1	
R2008		ERDS2TJ104	100K	1	
R2010		ERDS2TJ563	56K	1	
R2012		ERDS2TJ104	100K	1	
R2013		ERDS2TJ105	1M	1	
R2014		ERDS2TJ332	3.3K	1	
R2015		ERDS2TJ104	100K	1	
R2016		ERDS2TJ560	56	1	
R2017,2018		ERDS2TJ103	10K	2	
R2019,2020		ERDS2TJ473	47K	2	
R2021		ERDS2TJ563	56K	1	
R2022		ERDS2TJ473	47K	1	
R2023		ERDS2TJ562	5.6K	1	
R2024		ERDS2TJ223	22K	1	
R2025		ERDS2TJ823	82K	1	
R2026		ERD25TG103	10K	1	
R2027		ERD25TG123	12K	1	
R2028		ERD25TG683	68K	1	
R2029,2030		ERDS2TJ154	150K	2	
R2031		ERDS2TJ124	120K	1	
R2032		ERDS2TJ333	33K	1	
R2033		ERDS2TJ272	2.7K	1	
R2034		ERDS2TJ224	220K	1	
R2035		ERDS2TJ333	33K	1	
R2036		ERDS2TJ103	10K	1	
R2037		ERDS2TJ683	68K	1	
R2038,2039		ERDS2TJ103	10K	2	
R2040,2041		ERDS2TJ332	3.3K	2	
R2045		ERDS2TJ473	47K	1	
R2046		ERDS2TJ183	18K	1	
R2047		ERDS2TJ824	820K	1	
R2050		ERDS2TJ104	100K	1	
R2051		ERDS2TJ224	220K	1	
R2052-2054		ERDS2TJ220	22	3	
R2055		ERX12ANJ1R0	Metal Oxide 1/2W 1.0	1	
R2056		ERDS2TJ124	120K	1	
R2057		ERDS2TJ153	15K	1	
R2058		ERDS2TJ103	10K	1	
R2060		ERDS2TJ682	6.8K	1	
R2061		EVM38GA00B54	Variable 50K	1	
R2062		ERDS2TJ682	6.8K	1	
R2063		EVM38GA00B54	Variable 50K	1	
R2064		EVM38GA00B15	Variable 100K	1	
R2065		ERDS2TJ102	1K	1	
R2066		ERDS2TJ104	100K	1	
R2067		ERDS2TJ103	10K	1	
R2068		ERDS2TJ222	2.2K	1	
R2069		ERDS2TJ101	100	1	
R2070		ERDS2TJ102	1K	1	
R2071		EROS2CKG2202	22K	1	
R2072		ERDS2TJ104	100K	1	
R2073		ERDS2TJ823	82K	1	
R2074		ERDS2TJ184	180K	1	
R2075		ERDS2TJ682	6.8K	1	
R2076		ERDS2TJ393	39K	1	
R2077		ERDS2TJ334	330K	1	
R2078,2079		ERDS2TJ104	100K	2	
R2080		ERDS2TJ563	56K	1	
R2081,2082		ERDS2TJ103	10K	2	
R2083		ERDS2TJ473	47K	1	
R2084		ERDS2TJ104	100K	1	
R2085		ERD25TG563	56K	1	
R2086		ERD25TG103	10K	1	
R2087		ERD25TG332	3.3K	1	
R2088		ERDS2TJ104	100K	1	
R2089		ERD25TG821	820	1	
R2090		ERDS2TJ471	470	1	
R2091		ERDS2TJ472	4.7K	1	
R2092		ERD25TG471	470	1	
R2093		ERDS2TJ104	100K	1	
R2094		ERDS2TJ102	1K	1	
R2099		ERDS2TJ472	4.7K	1	
R2100		ERDS2TJ333	33K	1	
R2101		ERDS2TJ102	1K	1	
R2102		ERDS2TJ103	10K	1	
R2103		ERG12ANJ820	Metal Oxide 1/2W 82	1	
R2104		ERDS2TJ103	10K	1	
R2105		ERG12ANK820	Metal Oxide 1/2W 82	1	
R2106		ERDS2RJ103	10K	1	
R2107		ERG12ANJ820	Meral Oxide 1/2W 82	1	
R2108-2111		ERDS2TJ151	150	4	
R2112		ERDS2TJ103	10K	1	
R2113		ERDS2TJ151	150	1	
R2114		ERDS2TJ103	10K	1	
R2115		ERDS2TJ151	150	1	
R2116		ERDS2TJ103	10K	1	
R2117		ERDS2TJ123	12K	1	
R2120		ERDS2TJ563	56K	1	
R2122		ERDS2TJ103	10K	1	
R2155		ERDS2TJ104	100K	1	
R2156		ERDS2TJ333	33K	1	
R2157		ERDS2TJ104	100K	1	
R2158		ERDS2TJ561	560	1	
R2160,2161		ERDS2TJ103	10K	2	
R2162		ERDS2TJ333	33K	1	
R2163		ERDS2TJ224	220K	1	
R2164		ERDS2TJ333	33K	1	
R2165		ERDS2TJ563	56K	1	
R2166,2167		ERDS2TJ103	10K	2	
R2168		ERDS2TJ122	1.2K	1	
R2169		ERDS2TJ470	47	1	
R2170		ERDS2TJ681	680	1	
R2172,2173		ERDS2TJ333	33K	2	
R2174-2176		ERDS2TJ332	3.3K	3	
R2177,2178		ERDS2TJ103	10K	2	
R2179		ERDS2TJ104	100K	1	
R2180		ERDS2TJ223	22K	1	
R2181		ERDS2TJ102	1K	1	
R2183		ERDS2TJ103	10K	1	
R2184		ERDS2TJ221	220	1	
R2185		ERDS2TJ103	10K	1	
R2186,2187		ERDS2TJ223	22K	2	
R2191		ERDS2TJ333	33K	1	
R2192		ERDS2TJ103	10K	1	
R2193		ERDS2TJ152	1.5K	1	
R2194		ERDS2TJ103	10K	1	
R2197		ERDS2TJ563	56K	1	
R2198		ERDS2TJ333	33K	1	
R2199		ERDS2TJ563	56K	1	
R2200		ERDS2TJ104	100K	1	
R2201		ERDS2TJ102	1K	1	
R2202		ERDS2TJ223	22K	1	
R2203		ERDS2TJ471	470	1	
R2204		ERDS2TJ223	22K	1	
R2205		ERDS2TJ105	1M	1	
R2206,2207		ERDS2TJ103	10K	2	
R2208		ERDS2TJ105	1M	1	
R2209		ERDS2TJ223	22K	1	
R2210		ERDS2TJ391	390	1	
R2211		ERDS2TJ223	22K	1	

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Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R2212		ERDS2TJ471	470	1	
R2213		ERDS2TJ563	56K	1	
R2214		ERDS2TJ333	33K	1	
R2216		ERDS2TJ103	10K	1	
R2217		ERDS2TJ682	6.8K	1	
R2218		ERDS2TJ104	100K	1	
R2221		ERDS2TJ103	10K	1	
R2222		ERDS2TJ333	33K	1	
R2223		ERDS2TJ223	22K	1	
R2227		ERDS2TJ333	33K	1	
R2228		ERDS2TJ103	10K	1	
R2231		ERDS2TJ332	3.3K	1	
R2232		ERDS2TJ821	820	1	
R2234,2235		ERDS2TJ333	33K	2	
R2236		ERDS2TJ391	390	1	
R2238-2240		ERDS2TJ103	10K	3	
R2243		ERDS2TJ184	180K	1	
R2244		ERDS2TJ103	10K	1	
R2245		ERDS2TJ333	33K	1	
R2246,2247		ERDS2TJ104	100K	2	
R2248		ERDS2TJ222	2.2K	1	
R2249		EVM38GA00B24	Variable 20K	1	
R2250		ERDS2TJ562	5.6K	1	
R2253,2254		ERDS2TJ333	33K	2	
R2256		ERDS2TJ392	3.9K	1	
R2257		ERX1ANJR82	Metal Oxide 1W 0.82	1	Ⓡ
R2258		ERDS2TJ563	56K	1	
R2259		ERDS2TJ153	15K	1	
R2262,2263		ERDS2TJ104	100K	2	
R2264		ERDS2TJ103	10K	1	
R2266		ERDS2TJ104	100K	1	
R2267		ERDS2TJ103	10K	1	
R2268		ERDS2TJ333	33K	1	
R2269		ERDS2TJ103	10K	1	
R2272		ERDS2TJ103	10K	1	
R2282		ERDS2TJ104	100K	1	
R2283		ERDS2TJ333	33K	1	
R2284		ERDS2TJ104	100K	1	
R2295		ERDS2TJ124	120K	1	
R2296		ERDS2TJ224	220K	1	
R2300		ERDS2TJ333	33K	1	
R2301		ERDS2TJ104	100K	1	
R2302		ERDS2TJ333	33K	1	
R2303-2305		ERDS2TJ471	470	3	
R2306-2308		ERDS2TJ104	100K	3	
R2310		ERDS2TJ104	100K	1	
R2311		ERDS2TJ823	82K	1	
R2312		ERDS2TJ333	33K	1	
R2313		ERDS2TJ104	100K	1	
R2314		ERDS2TJ333	33K	1	
R2315		ERDS2TJ104	100K	1	
R2316		ERDS2TJ223	22K	1	
R2317		ERDS2TJ104	100K	1	
R2318		ERDS2TJ333	33K	1	
R2319		ERDS2TJ104	100K	1	
R2320,2321		ERDS2TJ333	33K	2	
R2322		ERDS2TJ334	330K	1	
R2323		ERDS2TJ222	2.2K	1	
R2336		ERDS2TJ333	33K	1	
R2337		ERDS2TJ104	100K	1	
R2352		ERDS2TJ123	12K	1	
R2353		ERDS2TJ104	100K	1	
R2354		ERDS2TJ333	33K	1	
R2355		ERDS2TJ104	100K	1	
R2356		ERDS2TJ822	8.2K	1	
			Capacitors		
C2001		ECQM1H563JZ	Mylar 50V 0.053	1	
C2002		ECQV05184JZ	Mylar 50V 0.18	1	
C2003		ECEA1HS010	Electrolytic 50V 1	1	
C2004		ECKF1H472KB	Ceramic 50V 4700P	1	
C2005		ECQV05823JZ	Mylar 50V 0.082	1	
C2006		ECQM1H223KZ	Mylar 50V 0.022	1	
C2007		ECEA0JS470	Electrolytic 6.3V 47	1	
C2008		ECEA1HN010	Electrolytic 50V 1	1	
C2009		ECEA1CN100	Electrolytic 16V 10	1	
C2010		ECEA0JS470	Electrolytic 6.3V 47	1	
C2011		ECQM1H562KZ	Mylar 50V 5600P	1	
C2012		ECQV05104JB	Mylar 50V 0.1	1	
C2013		ECQM1H562KZ	Mylar 50V 5600P	1	
C2014		ECEA1CS101	Electrolytic 16V 100	1	
C2015		ECEA1EN3R3	Electrolytic 25V 3.3	1	
C2016		ECEA1HS2R2	Electrolytic 50V 2.2	1	
C2017		ECQM1H103KZ	Mylar 50V 0.01	1	
C2018-2020		ECEA1HN010	Electrolytic 50V 1	3	
C2021		ECQM1H333KZ	Mylar 50V 0.033	1	
C2022		ECEA1HS3R3	Electrolytic 50V 3.3	1	
C2023-2025		ECEA50ZR22	Electrolytic 50V 0.22	3	
C2026		ECQM1H822KZ	Mylar 50V 8200P	1	
C2027		ECEA1CS101	Electrolytic 16V 100	1	
C2028		ECEA1AS101	Electrolytic 10V 100	1	
C2029		ECKF1H103ZF	Ceramic 50V 0.01	1	
C2030,2031		ECQV05683JZ	Mylar 50V 0.068	2	
C2032		ECQV05274JZ	Mylar 50V 0.27	1	
C2033		ECQM1H182KZ	Mylar 50V 1800P	1	
C2034		ECEA1HS010	Electrolytic 50V 1	1	
C2035		ECEA1CS100	Electrolytic 16V 10	1	
C2036		ECEA0JS470	Electrolytic 6.3V 47	1	
C2037		ECQM1H273KZ	Mylar 50V 0.027	1	
C2038		ECEA0JS101	Electrolytic 6.3V 100	1	
C2039		ECKF1H221KB	Ceramic 50V 220P	1	
C2041		ECQM1H392JZ	Mylar 50V 3900P	1	
C2042		ECQM1H103KZ	Mylar 50V 0.01	1	
C2043		ECEA1CS470	Electrolytic 16V 47	1	
C2044		ECQM1H272KZ	Mylar 50V 2700P	1	
C2045		ECQV05563JZ	Mylar 50V 0.056	1	
C2046		ECEA0JS470	Electrolytic 6.3V 47	1	
C2049		ECQM1H153KZ	Mylar 50V 0.015	1	
C2050		ECEA50ZR33	Electrolytic 50V 0.33	1	
C2051		ECQM1H332KZ	Mylar 50V 3300P	1	
C2052-2054		ECEA1HN010	Electrolytic 50V 1	1	
C2055		ECQM1H103KZ	Mylar 50V 0.01	1	
C2056		ECQV05334JZ	Mylar 50V 0.33	1	
C2057		ECQM1H103KZ	Mylar 50V 0.01	1	
C2058		ECEA1CS101	Electrolytic 16V 100	1	
C2059-2061		ECEA50ZR33	Electrolytic 50V 0.33	1	
C2062		ECEA1HS010	Electrolytic 50V 1	1	
C2063		ECQV05104JB	Mylar 50V 0.1	1	
C2064		ECEA1HS2R2	Electrolytic 50V 2.2	1	
C2065		ECKF1H103ZF	Ceramic 50V 0.01	1	
C2077		ECEA1CS470	Electrolytic 16V 47	1	
C2078,2079		ECEA50ZR68	Electrolytic 50V 0.68	2	
C2081,2082		ECCF1H680KC	Ceramic 50V 68P	2	
C2083		ECQV05104JB	Mylar 50V 0.1	1	
C2084,2085		ECKF1H103ZF	Ceramic 50V 0.01	2	
C2086		ECQM1H683KZ	Mylar 50V 0.068	1	
C2087		ECQM1H154KZ	Mylar 50V 0.15	1	
C2088,2089		ECCF1H680KC	Ceramic 50V 68P	2	
C2090,2091		ECEA1CS100	Electrolytic 16V 10	2	
C2092		ECQV05104JB	Mylar 50V 0.1	1	
C2093		ECEA1ES470	Electrolytic 25V 47	1	
C2094		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C2095		ECEA0JK330	Electrolytic 6.3V 33	1	
C2096		ECEA0JK470	Electrolytic 6.3V 47	1	
C2098		ECQV05683JZ	Mylar 50V 0.068	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Coils		
L2001,2002		VLQEL06F470K	Peaking 47µH	2	
			Resistor Arrays		
RA2001		EXBP87103K	10K x 7	1	
RA2002		EXBP84103K	10K x 4	1	
			Crystals		
X2001,2002		VSX0082		2	
			Connectors		
P001		VJP1238	11P	1	
P2001		VJP1235	8P	1	
P2002		VJP1229	2P	1	
P2003		VJP1237	10P	1	
P2004		VJP1235	8P	1	
P2005		VJP1235	8P	1	
P2006		VJP1233	6P	1	
P2008		VJP1229	2P	1	
P2009		VJP1232	5P	1	
P2010		VJP1231	4P	1	
P2012		VJP1230	3P	1	
			Test Terminals		
TP2001-2006		TJE98101		6	
TP2007		VJH24		1	
TP2008-2022		TJE98101		15	
TPG1-3		TJE98101		3	
			Miscellaneous		
		VSC0495	Heat Sink	2	
		XTV3+8BFN	Screw	4	
		XSN3+8S	Screw	6	
		XWA3B	Spring Washer	6	
		XWG3	Washer	6	
		XJF0013	Clamper	1	
		VMX0549	C.B. Spacer	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VEP03164E	Luminance & Chrominance		
			C.B.A.		
			Integrated Circuits		
IC3001		AN6310		1	®
IC3002		AN6320N		1	®
IC3005		SN76670N		1	®
IC3006		AN6332		1	®
IC8301		AN6360		1	®
IC8302		AN6362		1	®
IC8303		AN6361N		1	®
			Transistors		
Q3001		2SB643		1	(P,Q,R)
Q3002		2SC2206		1	(B,C)
Q3003-3006		2SD636		4	(Q,R)
Q3007		2SC2377		1	(B,C)
Q3008		2SC2206		1	(B,C)
Q3009		2SB641		1	(Q,R)
Q3010-3012		2SD638		3	(Q,R)
Q3016		2SD636		1	(Q,R)
Q3017,3018		2SC2206		2	(B,C)
Q3020		2SD636		1	(Q,R)
Q3021,3022		2SC2206		2	(B,C)
Q3023		2SB641		1	(Q,R)
Q3024		2SC2206		1	(B,C)
Q3025		2SB641		1	(Q,R)
Q3026,3027		2SC2206		2	(B,C)
Q3030		2SB641		1	(Q,R)
Q3031		2SD636		1	(Q,R)
Q3032		2SB641		1	(Q,R)
Q3033		2SD636		1	(Q,R)
Q3036		2SC2206		1	(B,C)
Q3039,3040		2SD636		2	(Q,R)
Q3041		2SD1266		1	(P,Q)
Q3042-3044		2SD636		3	(Q,R)
Q3045		2SC2206		1	(B,C)
Q3046		2SD636		1	(Q,R)
Q8301		2SD636		1	(Q,R)
Q8303		2SC2377		1	(B,C)
Q8305,8306		2SD636		2	(Q,R)
Q8310-8312		2SD636		3	(Q,R)
Q8331		2SD636		1	(Q,R)
Q8336		2SD636		1	(Q,R)
			Diodes		
D3001		MA165		1	
D3004,3005		MA165		2	
D3007-3009		MA165		3	
D3012,3013		MA165		2	
D3015		MA165		1	
D3017		RD6.2EB	Zener	1	
D3018		1SS16		1	®
D8302-8304		MA165		3	
D8310		MA165		1	
D8324,8325		MA165		2	
D8326		1S1007		1	
D8328		1S1007		1	

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Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistors		
R3001,3002		ERDS2TJ102	1K	2	
R3004		ERDS2TJ122	1.2K	1	
R3005		EVM38GA00B53	Variable 5K	1	
R3006		ERDS2TJ103	10K	1	
R3007		ERD25TJ334	330K	1	
R3008,3009		ERDS2TJ332	3.3K	2	
R3010		ERDS2TJ271	270	1	
R3011		ERDS2TJ222	2.2K	1	
R3012,3013		ERDS2TJ102	1K	2	
R3014		ERDS2TJ122	1.2K	1	
R3016		ERDS2TJ681	680	1	
R3017		ERDS2TJ102	1K	1	
R3018		EVM38GA00B53	Variable 5K	1	
R3019		ERDS2TJ470	47	1	
R3020		ERDS2TJ821	820	1	
R3023		ERDS2TJ392	3.9K	1	
R3024		ERDS2TJ182	1.8K	1	
R3025		ERDS2TJ561	560	1	
R3026		ERDS2TJ102	1K	1	
R3027		ERDS2TJ562	5.6K	1	
R3028,3029		EVM38GA00B53	Variable 5K	2	
R3030		ERDS2TJ562	5.6K	1	
R3031		ERDS2TJ332	3.3K	1	
R3032,3033		ERDS2TJ561	560	2	
R3034		ERDS2TJ223	22K	1	
R3035		ERDS2TJ103	10K	1	
R3036		ERDS2TJ222	2.2K	1	
R3037		ERDS2TJ393	39K	1	
R3038		ERDS2TJ103	10K	1	
R3039		EVM38GA00B23	Variable 2K	1	
R3040		ERDS2TJ103	10K	1	
R3041		ERDS2TJ473	47K	1	
R3042		ERDS2TJ820	82	1	
R3043		ERDS2TJ821	820	1	
R3044		ERDS2TJ102	1K	1	
R3045		ERDS2TJ682	6.8K	1	
R3046		ERDS2TJ122	1.2K	1	
R3047		ERDS2TJ152	1.5K	1	
R3048		ERDS2TJ122	1.2K	1	
R3049		ERDS2TJ221	220	1	
R3050		ERDS2TJ560	56	1	
R3051		EVM38GA00B23	Variable 2K	1	
R3052		ERDS2TJ682	6.8K	1	
R3053,3054		ERDS2TJ560	56	2	
R3055		ERDS2TJ152	1.5K	1	
R3056		ERDS2TJ681	680	1	
R3057		ERDS2TJ100	10	1	
R3058		ERDS2TJ272	2.7K	1	
R3059		ERDS2TJ100	10	1	
R3060		ERDS2TJ272	2.7K	1	
R3061,3062		ERDS2TJ473	47K	2	
R3063		EVM38GA00B13	Variable 1K	1	
R3064		ERDS2TJ561	560	1	
R3065		ERDS2TJ103	10K	1	
R3066		ERDS2TJ822	8.2K	1	
R3067		EVM38GA00B23	Variable 2K	1	
R3068		ERDS2TJ102	1K	1	
R3069		EVM38GA00B23	Variable 2K	1	
R3070		ERDS2TJ822	8.2K	1	
R3071		ERDS2TJ561	560	1	
R3072		EVM38GA00B13	Variable 1K	1	
R3073		ERDS2TJ473	47K	1	
R3095,3096		ERDS2TJ153	15K	2	
R3097		ERDS2TJ102	1K	1	
R3098		ERDS2TJ472	4.7K	1	
R3099		ERDS2TJ272	2.7K	1	
R3100,3101		ERDS2TJ561	560	2	
R3102		ERDS2TJ332	3.3K	1	
R3103		ERDS2TJ102	1K	1	
R3104		ERDS2TJ561	560	1	
R3105		ERDS2TJ820	82	1	
R3109,3110		ERDS2TJ102	1K	2	
R3111		ERDS2TJ331	330	1	
R3112-3114		ERDS2TJ102	1K	3	
R3115		ERDS2TJ272	2.7K	1	
R3116		ERDS2TJ271	270	1	
R3117		ERDS2TJ391	390	1	
R3118,3119		ERDS2TJ102	1K	2	
R3120,3121		ERDS2TJ223	22K	2	
R3122		EVM38GA00B24	Variable 20K	1	
F3123		ERDS2TJ153	15K	1	
R3124		ERDS2TJ102	1K	1	
R3125		ERDS2TJ222	2.2K	1	
R3126		ERDS2TJ561	560	1	
R3127		ERDS2TJ471	470	1	
R3128		ERDS2TJ333	33K	1	
R3129		ERDS2TJ562	5.6K	1	
R3130		ERDS2TJ102	1K	1	
R3131		ERDS2TJ121	120	1	
R3132		ERDS2TJ273	27K	1	
R3133		ERDS2TJ183	18K	1	
R3134,3135		ERDS2TJ271	270	2	
R3136		ERDS2TJ102	1K	1	
R3137		ERDS2TJ222	2.2K	1	
R3138		ERDS2TJ221	220	1	
R3139		ERDS2TJ331	330	1	
R3140		ERDS2TJ103	10K	1	
R3141		ERDS2TJ102	1K	1	
R3142		ERDS2TJ821	820	1	
R3143		ERDS2TJ330	33	1	
R3144		ERDS2TJ121	120	1	
R3145		ERDS2TJ152	1.5K	1	
R3146		ERDS2TJ223	22K	1	
R3147		EVM38GA00B24	Variable 20K	1	
R3148		ERDS2TJ823	82K	1	
R3149		ERDS2TJ152	1.5K	1	
R3150		ERDS2TJ331	330	1	
R3151		ERDS2TJ821	820	1	
R3152		ERDS2TJ472	4.7K	1	
R3153		ERDS2TJ181	180	1	
R3154		ERDS2TJ561	560	1	
R3155		ERDS2TJ151	150	1	
R3156,3157		ERDS2TJ181	180	2	
R3158		EVTK4CA00B23	Variable 2K	1	
R3159,3160		ERDS2TJ153	15K	2	
R3161,3162		ERDS2TJ222	2.2K	2	
R3163		EVM38GA00B23	Variable 2K	1	
R3164		ERDS2TJ333	33K	1	
R3165		ERDS2TJ682	6.8K	1	
R3166		ERDS2TJ471	470	1	
R3167		ERDS2TJ271	270	1	
R3168		ERDS2TJ181	180	1	
R3172		ERDS2TJ122	1.2K	1	
R3173		ERDS2TJ222	2.2K	1	
R3174		ERDS2TJ152	1.5K	1	
R3175		ERDS2TJ392	3.9K	1	
R3176		ERDS2TJ562	5.6K	1	
R3177		ERDS2TJ222	2.2K	1	
R3179		ERDS2TJ561	560	1	
R3180		ERDS2TJ681	680	1	
R3181		ERDS2TJ102	1K	1	
R3182		ERDS2TJ562	5.6K	1	
R3183		ERDS2TJ151	150	1	
R3186		EVM38GA00B23	Variable 2K	1	
R3187		ERDS2TJ474	470K	1	
R3188		ERDS2TJ101	100	1	
R3189		ERDS2TJ121	120	1	
R3190		ERDS2TJ103	10K	1	
R3191		ERDS2TJ562	5.6K	1	

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Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R3192		ERDS2TJ121	120	1	
R3193		ERDS2TJ471	470	1	
R3194		ERDS2TJ121	120	1	
R3195		ERDS2TJ103	10K	1	
R3196		ERDS2TJ562	5.6K	1	
R3197		ERDS2TJ121	120	1	
R3205		EVM38GA00B14	Variable 10K	1	
R3206		ERDS2TJ223	22K	1	
R3207		ERDS2TJ562	5.6K	1	
R3208		ERDS2TJ221	220	1	
R3209		ERDS2TJ471	470	1	
R3210		ERDS2TJ182	1.8K	1	
R3213		ERDS2TJ154	150K	1	
R3215		ERDS2TJ562	5.6K	1	
R3217		ERDS2TJ682	6.8K	1	
R3223		ERDS2TJ331	330	1	
R3224		ERDS2TJ682	6.8K	1	
R3228,3229		ERDS2TJ223	22K	2	
R3230		ERDS2TJ562	5.6K	1	
R3232		ERDS2TJ103	10K	1	
R3233		ERDS2TJ102	1K	1	
R3234		ERDS2TJ222	2.2K	1	
R3235		ERDS2TJ561	560	1	
R3238-3240		ERDS2TJ102	1K	3	
R3241		ERDS2TJ152	1.5K	1	
R3242		ERDS2TJ182	1.8K	1	
R3243		ERDS2TJ122	1.2K	1	
R3244		ERDS2TJ182	1.8K	1	
R3245		ERDS2TJ103	10K	1	
R3246,3247		ERDS2TJ333	33K	2	
R3248		ERDS2TJ103	10K	1	
R3249		ERDS2TJ471	470	1	
R3251		ERDS2TJ102	1K	1	
R3253		ERDS2TJ151	150	1	
R3254		ERDS2TJ121	120	1	
R3255		ERDS2TJ222	2.2K	1	
R3256		ERDS2TJ681	680	1	
R3259		ERDS2TJ103	10K	1	
R3261,3262		ERDS2TJ223	22K	2	
R3264		ERDS2TJ272	2.7K	1	
R8301		ERDS2TJ821	820	1	
R8302		ERDS2TJ152	1.5K	1	
R8303		ERD25TJ684	680K	1	
R8304		ERD25TJ105	1M	1	
R8306		ERDS2TJ122	1.2K	1	
R8307		ERDS2TJ563	56K	1	
R8309		ERDS2TJ103	10K	1	
R8310		ERDS2TJ102	1K	1	
R8311		ERDS2TJ181	180	1	
R8312		ERDS2TJ271	270	1	
R8316		ERDS2TJ183	18K	1	
R8317		ERDS2TJ562	5.6K	1	
R8318		ERD25TJ224	220K	1	
R8320		ERDS2TJ332	3.3K	1	
R8321		ERDS2TJ102	1K	1	
R8322		ERDS2TJ122	1.2K	1	
R8323		ERDS2TJ102	1K	1	
R8325		ERDS2TJ102	1K	1	
R8326		ERDS2TJ152	1.5K	1	
R8327		ERDS2TJ222	2.2K	1	
R8328		ERDS2TJ273	27K	1	
R8329		ERDS2TJ562	5.6K	1	
R8330		ERDS2TJ102	1K	1	
R8331		ERDS2TJ472	4.7K	1	
R8332		ERDS2TJ682	6.8K	1	
R8333		ERDS2TJ681	680	1	
R8336		ERDS2TJ222	2.2K	1	
R8337		EVM38GA00B52	Vairable 500	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R8338		ERDS2TJ122	1.2K	1	
R8339		ERDS2TJ472	4.7K	1	
R8341		ERDS2TJ391	390	1	
R8342		EVM38GA00B53	Variable 5K	1	
R8343-8346		ERDS2TJ391	390	4	
R8355,8356		ERDS2TJ102	1K	2	
R8357		ERDS2TJ273	27K	1	
R8358		ERDS2TJ103	10K	1	
R8359		ERDS2TJ102	1K	1	
R8360		ERDS2TJ273	27K	1	
R8361		ERDS2TJ103	10K	1	
R8362		ERDS2TJ222	2.2K	1	
R8363		ERDS2TJ272	2.7K	1	
R8364		ERDS2TJ560	56	1	
R8365		ERDS2TJ102	1K	1	
R8366,8367		ERDS2TJ103	10K	2	
R8368		ERDS2TJ392	3.9K	1	
R8369		ERDS2TJ182	1.8K	1	
R8372		ERDS2TJ222	2.2K	1	
R8373		ERD25TJ334	330K	1	
R8435		ERDS2TJ333	33K	1	
R8439		ERDS2TJ333	33K	1	
R8440		ERD50TJ121	1/2W 120	1	
R8441		ERDS2TJ222	2.2K	1	
R8442		ERDS2TJ562	5.6K	1	
R8450		ERDS2TJ562	5.6K	1	
R8451		ERDS2TJ563	56K	1	
R8452		ERDS2TJ561	560	1	
R8453		ERDS2TJ393	39K	1	
R8454		ERDS2TJ183	18K	1	
R8457		ERDS2TJ121	120	1	
R8458		ERDS2TJ102	1K	1	
R8459		ERDS2TJ152	1.5K	1	
			Capacitors		
C3001		ECEA0JS470	Electrolytic 6.3V 47	1	
C3002		ECEA1CS220	Electrolytic 16V 22	1	
C3003		ECEA0JN470	Electrolytic 6.3V 47	1	
C3004		ECEA1AS101	Electrolytic 10V 100	1	
C3005		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C3006		ECEA0JS221	Electrolytic 6.3V 220	1	
C3007		VCY25333KW	Semiconductor 25V 0.033	1	
C3008		VCKD1H621JS	Ceramic 50V 620P	1	
C3009		ECCF1H330KC	Ceramic 50V 33P	1	
C3010		ECCF1H270KC	Ceramic 50V 27P	1	
C3011		ECEA1AS470	Electrolytic 10V 47	1	
C3012		ECQV05473JZ	Mylar 50V 0.047	1	
C3013		ECEA1AS221	Electrolytic 10V 220	1	
C3015		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3016		ECEA0JN470	Electrolytic 6.3V 47	1	
C3017		ECEA0JS470	Electrolytic 6.3V 47	1	
C3018		ECEA1CS221	Electrolytic 16V 220	1	
C3019		ECEA0JN470	Electrolytic 6.3V 47	1	
C3021		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C3022		ECCF1H560KC	Ceramic 50V 56P	1	
C3023		ECV1ZW50X64	Trimmer 500V 50P	1	
C3024		ECEA1CS470	Electrolytic 16V 47	1	
C3025-3028		ECKF1H103ZF	Ceramic 50V 0.01	4	
C3029		ECEA0JS470	Electrolytic 6.3V 47	1	
C3030		ECCF1H680KC	Ceramic 50V 68P	1	
C3031		VCKD1H331JS	Ceramic 50V 330P	1	
C3032,3033		ECKF1H103ZF	Ceramic 50V 0.01	2	
C3034		ECKF1H391KB	Ceramic 50V 390P	1	
C3035		ECEA1CS100	Electrolytic 16V 10	1	
C3036		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3037		ECCF1H390KC	Ceramic 50V 39P	1	
C3038,3039		ECKF1H103ZF	Ceramic 50V 0.01	2	
C3040		VCY25104KW	Semiconductor 25V 0.1	1	

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Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C3041		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3042		ECEA1CS470	Electrolytic 16V 47	1	
C3043		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3044		ECEA1CS470	Electrolytic 16V 47	1	
C3045		ECEA1HS010	Electrolytic 50V 1	1	
C3046		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3047,3048		ECV1ZW50X64	Trimmer 500V 50P	2	
C3049		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3050		ECEA1HS010	Electrolytic 50V 1	1	
C3051		ECEA1CS100	Electrolytic 16V 10	1	
C3052,3053		ECKF1H103ZF	Ceramic 50V 0.01	2	
C3054		ECCF1H680KC	Ceramic 50V 68P	1	
C3055		ECCF1H470KC	Ceramic 50V 47P	1	
C3056		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3057		VCY25153KW	Semiconductor 25V 0.015	1	
C3058		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3059		ECCF1H680KC	Ceramic 50V 68P	1	
C3060		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3078		VCY25473KW	Semiconductor 25V 0.047	1	
C3079		ECEA1CS221	Electrolytic 16V 220	1	
C3080-3082		ECKF1H103ZF	Ceramic 50V 0.01	3	
C3083		ECCF1H151KC	Ceramic 50V 150P	1	
C3084		VCKD1H391JS	Ceramic 50V 390P	1	
C3085		VCKD1H431JS	Ceramic 50V 430P	1	
C3086		VCKD1H391JS	Ceramic 50V 390P	1	
C3087-3089		ECKF1H103ZF	Ceramic 50V 0.01	3	
C3090		ECCF1H680KC	Ceramic 50V 68P	1	
C3091-3093		ECKF1H103ZF	Ceramic 50V 0.01	3	
C3094-3096		ECCF1H270KC	Ceramic 50V 27P	3	
C3097-3100		ECKF1H103ZF	Ceramic 50V 0.01	4	
C3101		VCY25473KW	Semiconductor 25V 0.047	1	
C3102		ECEA1CS470	Electrolytic 16V 47	1	
C3103		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3104		ECCF1H560KC	Ceramic 50V 56P	1	
C3105		VCKD1H221JS	Ceramic 50V 220P	1	
C3106		VCY25222KW	Semiconductor 25V 2200P	1	
C3107		ECKF1H681KB	Ceramic 50V 680P	1	
C3108		ECKF1H122KB	Ceramic 50V 1200P	1	
C3109,3110		ECEA1CN100	Electrolytic 16V 10	2	
C3112		ECKF1H221KB	Ceramic 50V 220P	1	
C3113		ECEA0JS470	Electrolytic 6.3V 47	1	
C3114		ECEA1CS221	Electrolytic 16V 220	1	
C3115		VCY25473KW	Semiconductor 25V 0.047	1	
C3116		ECCF1H220KC	Ceramic 50V 22P	1	
C3117		ECEA1CS100	Electrolytic 16V 10	1	
C3118		ECCF1H680KC	Ceramic 50V 68P	1	
C3119		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3120		ECEA1CS471	Electrolytic 16V 470	1	
C3121		ECEA0JS470	Electrolytic 6.3V 47	1	
C3124		ECEA0JS470	Electrolytic 6.3V 47	1	
C3125		ECEA1CS100	Electrolytic 16V 10	1	
C3126		VCKD1H271JS	Ceramic 50V 270P	1	
C3127		ECCF1H270KC	Ceramic 50V 27P	1	
C3128		ECKF1H103ZF	Ceramic 50V 0.01	1	
C3129		ECEA1HSS010	Electrolytic 50V 1	1	
C3130		ECEA1CU221	Electrolytic 16V 220	1	
C3131		ECEA1ASS470	Electrolytic 10V 47	1	
C3132		VCY25183KW	Semiconductor 25V 0.018	1	
C3133		ECCF1H101KC	Ceramic 50V 100P	1	
C3134,3135		ECEA0JS470	Electrolytic 6.3V 47	2	
C3136		ECEA0JS471	Electrolytic 6.3V 470	1	
C3137		ECEA1AS471	Electrolytic 10V 470	1	
C3138		ECEA0JS470	Electrolytic 6.3V 47	1	
C3139		ECEA0JS471	Electrolytic 6.3V 470	1	
C3140		ECEA1AS471	Electrolytic 10V 470	1	
C3143		ECEA1CS221	Electrolytic 16V 220	1	
C3144		ECQM1H473KZ	Mylar 50V 0.047	1	
C3149		ECKF1H103ZF	Ceamic 50V 0.01	1	
C3150		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C3151		ECEA0JS101	Electrolytic 6.3V 100	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C3157,3158		ECKF1H103ZF	Ceramic 50V 0.01	2	
C3159		ECEA1CS470	Electrolytic 16V 47	1	
C3160		ECCF1H101KC	Ceramic 50V 100P	1	
C3162		ECEA1ESS331	Electrolytic 25V 330	1	
C3163		ECEA1CK470	Electrolytic 16V 47	1	
C3164		ECKF1H221KB	Ceramic 50V 220P	1	
C3166		ECCF1H680KC	Ceramic 50V 68P	1	
C3169		ECEA1HS010	Electrolytic 50V 1	1	
C3170		ECEA1CS220	Electrolytic 16V 22	1	
C3171,3172		ECQV05104JZ	Mylar 50V 0.1	2	
C8302		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8303		ECEA1HS010	Electrolytic 50V 1	1	
C8304		ECEA0JS470	Electrolytic 6.3V 47	1	
C8305-8308		ECKF1H103ZF	Ceramic 50V 0.01	4	
C8310		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8312		ECQV05104JZ	Mylar 50V 0.1	1	
C8313,8314		ECKF1H103ZF	Ceramic 50V 0.01	2	
C8315		ECEA1CS470	Electrolytic 16V 47	1	
C8316,8317		ECKF1H103ZF	Ceramic 50V 0.01	2	
C8318		ECKF1H102KB	Ceramic 50V 1000P	1	
C8319		ECEA1AS470	Electrolytic 10V 47	1	
C8320		ECEA1CS470	Electrolytic 16V 47	1	
C8321		ECEA1HS010	Electrolytic 50V 1	1	
C8322		ECQV05104JZ	Mylar 50V 0.1	1	
C8323		ECKF1H152KB	Ceramic 50V 1500P	1	
C8324		ECQV05104JZ	Mylar 50V 0.1	1	
C8325		VCKD1H821JSA	Ceramic 50V 820P	1	
C8326		ECKF1H821KB	Ceramic 50V 820P	1	
C8327		ECKF1H561KB	Ceramic 50V 560P	1	
C8328		ECEA1CS100E	Electrolytic 16V 10	1	
C8329		VCY25183KW	Semiconductor 25V 0.018	1	
C8330		ECCF1H181KC	Ceramic 50V 180P	1	
C8331		ECCF1H121KC	Ceramic 50V 120P	1	
C8333		VCKD1H221JSA	Ceramic 50V 220P	1	
C8337		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8338		ECCF1H390KC	Ceramic 50V 39P	1	
C8339		ECEA1CS100	Electrolytic 16V 10	1	
C8340		ECCF1H271KC	Ceramic 50V 270P	1	
C8341		ECCF1H101KC	Ceramic 50V 100P	1	
C8342		ECCF1H100FC	Ceramic 50V 10P	1	
C8343		ECV1ZW30X64	Trimmer 500V 30P	1	
C8344		ECQM1H103KZ	Mylar 50V 0.01	1	
C8345		ECEA1CS100	Electrolytic 16V 10	1	
C8346		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8347		ECCF1H030DC	Ceramic 50V 3P	1	
C8348		ECV1ZW20X64	Trimmer 500V 20P	1	
C8349		ECCF1H080DC	Ceramic 50V 8P	1	
C8350		ECEA1CS470	Electrolytic 16V 47	1	
C8351,8352		ECKF1H103ZF	Ceramic 50V 0.01	2	
C8354		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8355		ECCF1H270KC	Ceramic 50V 27P	1	
C8356		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8357		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C8358		ECKF1H471KB	Ceramic 50V 470P	1	
C8359		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8400		ECEA1CS100	Electrolytic 16V 10	1	
C8402,8403		ECKF1H103ZF	Ceramic 50V 0.01	2	
C8407		ECKF1H103ZF	Ceramic 50V 0.01	1	
C8408		ECEA1CS330	Electrolytic 16V 33	1	
C8409		ECQV05104JZ	Mylar 50V 0.1	1	
C8410		ECCF1H101KC	Ceramic 50V 100P	1	
C8411		ECCF1H560KC	Ceramic 50V 56P	1	
			Coils		
L3001		VLQEL06F330K	Choke 33μH	1	
L3002		VLQEL06F680K	Choke 68μH	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
L3004,3005		VLQEL06F221K	Peaking 220μH	2	
L3006		VLQEL06F820K	Peaking 82μH	1	
L3007		VLQEL06F151K	Peaking 150μH	1	
L3008		VLQEL06F270K	Choke 27μH	1	
L3009		VLQEL06F470K	Choke 47μH	1	
L3010		VLQEL06F221K	Peaking 220μH	1	
L3011		VLQEL06F3R3K	Choke 3.3μH	1	
L3013		VLQEL06F471K	Peaking 470μH	1	
L3015		VLQEL06F3R3K	Choke 3.3μH	1	
L3022,3023		VLQEL06F221K	Peaking 220μH	2	
L3024		VLQEL06F470K	Choke 47μH	1	
L3025		VLQEL06F2R2K	Choke 2.2μH	1	
L3027		VLQEL06F151K	Peaking 150μH	1	
L3028		VLQEL06F471K	Peaking 470μH	1	
L3029,3030		VLQEL06F100K	Choke 10μH	2	
L3031		VLQEL06F180K	Choke 18μH	1	
L3032		VLQEL06F3R3K	Choke 3.3μH	1	
L3033		VLQEL06F330K	Choke 33μH	1	
L3035,3036		VLQEL06F221K	Peaking 220μH	2	
L3039		VLQEL06F471K	Peaking 470μH	1	
L3040		VLQEL06F330K	Choke 33μH	1	
L3043		VLQEL06F221K	Peaking 220μH	1	
L3045,3046		VLQEL06F221K	Peaking 220μH	2	
L3047		VLQEL06F181K	Choke 180μH	1	
L3048		VLQEL06F150K	Choke 15μH	1	
L8303		VLQEL06F221K	Peaking 220μH	1	
L8305		VLQEL06F221K	Peaking 220μH	1	
L8306		VLQ02F682K	Choke 6.8mH	1	
L8307		VLQEL06F101K	Peaking 100μH	1	
L8308,8309		VLQEL06F150K	Peaking 15μH	2	
L8311		VLQEL06F221K	Peaking 220μH	1	
L8312		VLQEL06F470K	Choke 47μH	1	
L8313		VLQEL06F221K	Peaking 220μH	1	
L8314		VLQEL06F680K	Peaking 68μH	1	
L8315		VLQEL06F560K	Peaking 56μH	1	
L8326		VLQEL06F221K	Peaking 220μH	1	
L8327		VLQEL06F560K	Peaking 56μH	1	
L8328		VLQEL06F150J	Choke 15μH	1	
			Filters		
FL3001		VLF0063		1	Ⓡ
FL3002		VLF0064		1	Ⓡ
FL3003		VLF0061		1	Ⓡ
FL3004		VLF0062		1	Ⓡ
FL8301		VLF0137		1	
FL8302		VLF0103		1	
FL8303		VLF0104		1	
FL8304		VLF0102		1	
FL8305		VLF0105		1	
			Delay Lines		
DL3001		EFDYN645A15A		1	Ⓡ
DL8303		VLD0013		1	
			Crystals		
X8301		VSX0060		1	
X8302		VSX0085		1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Connectors		
P3001		VJP1231	4P	1	
P3003		VJP1232	5P	1	
P3004		VJP1235	8P	1	
P3005,3006		VJP1230	3P	2	
P3007		VJP1231	4P	1	
P3008		VJP1144	6P	1	
P8302		VJP1235	8P	1	
			Test Terminals		
TP3001-3008		TJE98101		8	
TP3016,3017		TJE98101		2	
TP3019-3021		TJE98101		3	
TP8301-8311		TJE98101		11	
TP8316		TJE98101		1	
GND1,2		TJE98101		2	
		VJH28		2	
			Miscellaneous		
		QJT0015	Rag	1	
		VSC0969	Shield Case (Top)	1	
		VSC0970	Shield Case (Bottom)	1	
		WZBV1	Clamper	4	
		VEP06190A1	System Control C.B.A.		
			Integrated Circuits		
IC6001		μPC339C		1	Ⓡ
IC6002		HD7406P		1	Ⓡ
IC6003		μPD1512AC044		1	Ⓡ
IC6004,6005		BA6209		2	Ⓡ
IC6006		BAL872		1	Ⓡ
IC6007		μPC358C		1	Ⓡ
IC6008		PU4310		1	Ⓡ
IC6009		HD74LS148P		1	Ⓡ
IC6010		μPD4011BC		1	
IC6011		HD7406P		1	
IC6012		HD7407P		1	Ⓡ
IC6013		μPC358C		1	
			Transistors		
Q6003,6004		2SD636		2	(Q,R)
Q6005		2SB819		1	(P,Q,R)
Q6006-6008		2SD636		3	(Q,R)
Q6009		2SD637		1	(P,Q,R)
Q6010		2SB644		1	(P,Q,R)
Q6011,6012		2SB643		2	(P,Q,R)
Q6013		2SB819		1	(P,Q,R)
Q6019,6020		2SD636		2	(P,Q,R)
Q6021,6022		2SD636		2	(Q,R)
Q6024		2SD636		1	(Q,R)
Q6025		2SB641		1	(P,Q,R)
Q6026-6030		2SD636		5	(Q,R)
Q6032,6033		2SD636		2	(Q,R)
Q6034		2SB641		1	(P,Q,R)
Q6035-6037		2SD636		3	(Q,R)
Q6038		2SB641		1	(P,Q,R)
Q6039-6042		2SD636		4	(Q,R)

System Control C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
Q6044-6048		2SD636		5	(Q,R)
Q6051		2SD636		1	(Q,R)
Q6052		2SD1275		1	(P,Q,R)
Q6053-6057		2SD636		5	(Q,R)
			Diodes		
D6001		10E1		1	
D6010		10E1		1	
D6012		10E1		1	
D6014		RD10FB		1	
D6017		HZ4BLL	Zener	1	
D6018		MA165		1	
D6024		10E1		1	
D6027		RD10EB		1	
D6029-6031		MA165		3	
D6035-6037		MA165		3	
D6043,6044		MA165		2	
D6045		HZ3CLL	Zener	1	
D6046-6048		MA165		3	
D6050-6052		MA165		3	
D6057		MA165		1	
D6058		MA1075		1	
D6059-6067		MA165		9	
			Resistors		
R6001		ERDS2TJ103	10K	1	
R6002		ERDS2TJ391	390	1	
R6006		ERDS2TJ224	220K	1	
R6007		ERDS2TJ223	22K	1	
R6008		ERDS2TJ103	10K	1	
R6009		ERD25TJ225	2.2M	1	
R6011		ERDS2TJ224	220K	1	
R6012		ERDS2TJ473	47K	1	
R6013		ERDS2TJ472	4.7K	1	
R6014		ERDS2TJ473	47K	1	
R6015		ERDS2TJ333	33K	1	
R6016		ERDS2TJ103	10K	1	
R6017		ERDS2TJ680	68	1	
R6018		ERDS2TJ105	1M	1	
R6019		ERDS2TJ224	220K	1	
R6020		ERDS2TJ105	1M	1	
R6021		ERDS2TJ184	180K	1	
R6022		ERDS2TJ103	10K	1	
R6023		ERDS2TJ153	15K	1	
R6028-6030		ERDS2TJ103	10K	3	
R6035		ERDS2TJ103	10K	1	
R6040,6041		ERDS2TJ682	6.8K	2	
R6042,6043		ERDS2TJ223	22K	2	
R6044,6045		ERDS2TJ153	15K	2	
R6046		ERDS2TJ103	10K	1	
R6051,6052		ERDS2TJ103	10K	2	
R6053,6054		ERDS2TJ222	2.2K	2	
R6055,6056		ERDS2TJ181	180	2	
R6057-6060		ERDS2TJ472	4.7K	4	
R6061,6062		ERDS2TJ102	1K	2	
R6063		ERDS2TJ563	56K	1	
R6064		ERDS2TJ393	39K	1	
R6071		ERDS2TJ103	10K	1	
R6072		ERDS2TJ150	15	1	
R6073		ERDS2TJ103	10K	1	
R6075		ERDS2TJ104	100K	1	
R6076		ERG1ANJ101	Metal Oxide 1W 100	1	
R6078		ERDS2TJ223	22K	1	
R6080		ERDS2TJ103	10K	1	
R6081		ERDS2TJ153	15K	1	
R6086		ERDS2TJ102	1K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R6088		ERDS2TJ103	10K	1	
R6101		ERX1ANJR82	Metal Oxide 1W 0.82	1	
R6102		ERDS2TJ473	47K	1	
R6103		EVM38GA00B53	Variable 5K	1	
R6104		ERDS2TJ102	1K	1	
R6105		ERDS2TJ221	220	1	
R6106		ERDS2TJ102	1K	1	
R6108		ERDS2TJ102	1K	1	
R6109		ERX1ANJ1R0	Metal Oxide 1W 1.0	1	
R6110		ERDS2TJ154	150K	1	
R6111,6112		ERDS2TJ102	1K	2	
R6113		ERD50TJ221	1/2W 220	1	
R6114		ERDS2TJ222	2.2K	1	
R6115		ERDS2TJ103	10K	1	
R6119		ERDS2TJ102	1K	1	
R6120		ERDS2TJ103	10K	1	
R6121,6122		ERDS2TJ333	33K	2	
R6123		ERDS2TJ151	150	1	
R6124,6125		ERDS2TJ154	150K	2	
R6126		ERDS2TJ103	10K	1	
R6127		ERDS2TJ472	4.7K	1	
R6128,6129		ERDS2TJ104	100K	2	
R6130		ERDS2TJ562	5.6K	1	
R6131		ERDS2TJ103	10K	1	
R6132,6133		ERDS2TJ104	100K	2	
R6135		ERDS2TJ104	100K	1	
R6136		ERDS2TJ105	1M	1	
R6137		ERDS2TJ104	100k	1	
R6138		ERDS2TJ272	2.7K	1	
R6142		ERDS2TJ105	1M	1	
R6143,6144		ERDS2TJ564	560K	2	
R6145		ERDS2TJ123	12K	1	
R6146		ERDS2TJ103	10K	1	
R6147,6148		ERDS2TJ224	220K	2	
R6149		ERDS2TJ334	330K	1	
R6151		ERDS2TJ563	56K	1	
R6153-6155		ERDS2TJ104	100K	3	
R6156		ERDS2TJ564	560K	1	
R6158		ERDS2TJ103	10K	1	
R6159		ERDS2TJ105	1M	1	
R6160		ERDS2TJ824	820K	1	
R6161		ERDS2TJ103	10K	1	
R6162		ERDS2TJ102	1K	1	
R6163,6164		ERDS2TJ103	10K	2	
R6165		ERDS2TJ472	4.7K	1	
R6166		ERDS2TJ104	100K	1	
R6167,6168		ERDS2TJ103	10K	2	
R6169		ERDS2TJ104	100K	1	
R6170		ERDS2TJ103	10K	1	
R6171		ERDS2TJ683	68K	1	
R6172		ERDS2TJ105	1M	1	
R6173		ERDS2TJ334	330K	1	
R6174		ERDS2TJ105	1M	1	
R6178,6179		ERDS2TJ105	1M	2	
R6180		ERDS2TJ824	820K	1	
R6183		ERDS2TJ104	100K	1	
R6184		ERDS2TJ102	1K	1	
R6185,6186		ERDS2TJ104	100K	1	
R6187		ERDS2TJ562	5.6K	1	
R6188		ERDS2TJ564	560K	1	
R6195		ERDS2TJ103	10K	1	
R6196		ERDS2TJ334	330K	1	
R6197		ERDS2TJ103	10K	1	
R6198		ERX1ANJR68	Metal Oxide 1W 0.68	1	
R6199		ERDS2TJ820	82	1	
R6200		ERDS2TJ102	1K	1	
R6202,6203		ERDS2TJ563	56K	2	
R6204		ERDS2TJ562	5.6K	1	
R6205		ERDS2TJ222	2.2K	1	
R6206		ERDS2TJ563	56K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R6207		ERDS2TJ274	270K	1	
R6208		ERDS2TJ104	100K	1	
R6209		ERDS2TJ274	270K	1	
R6210		ERDS2TJ563	56K	1	
R6211		ERDS2TJ105	1M	1	
R6212		ERDS2TJ104	100K	1	
R6213		ERDS2TJ105	1M	1	
R6214		ERDS2TJ273	27K	1	
R6215		ERDS2TJ394	390K	1	
R6217		ERDS2TJ154	150K	1	
R6219		ERDS2TJ334	330K	1	
R6222,6223		ERDS2TJ102	1K	2	
R6225		ERDS2TJ104	100K	1	
R6226		ERDS2TJ105	1M	1	
R6227		ERDS2TJ222	2.2K	1	
			Capacitors		
C6001		ECCF1H181KC	Ceramic 50V 180P	1	
C6002		ECKF1H331KB	Ceramic 50V 330P	1	
C6004-6008		ECEA1HS010	Electrolytic 50V 1	5	
C6009		ECEA1CS470	Electrolytic 16V 47	1	
C6010		VCE0004	Electrolytic 10V 0.043F	1	
C6013		ECEA0JS470	Electrolytic 6.3V 47	1	
C6014		ECKF1H103ZF	Ceramic 50V 0.01	1	
C6015		ECEA1HS010	Electrolytic 50V 1	1	
C6016		ECQV05104JB	Mylar 50V 0.1	1	
C6017,6018		ECEA1ES101	Electrolytic 25V 100	2	
C6020-6023		ECKF1H103ZF	Ceramic 50V 0.01	4	
C6024,6025		ECCF1H680KC	Ceramic 50V 68P	2	
C6026		ECEA1CS100	Electrolytic 16V 10	1	
C6027		ECEA1HS010	Electrolytic 50V 1	1	
C6032,6033		ECKF1H103ZF	Ceramic 50V 0.01	2	
C6034		ECKF1H472KB	Ceramic 50V 4700P	1	
C6035,6036		ECKF1H103ZF	Ceramic 50V 0.01	2	
C6038		ECEA1ES470	Electrolytic 25V 47	1	
C6039		ECEA1CS470	Electrolytic 16V 47	1	
C6040		ECQM1H823JZ	Mylar 50V 0.082	1	
C6041		ECEA1CS100	Electrolytic 16V 10	1	
C6042		ECEA50ZR47	Electrolytic 50V 0.47	1	
C6043		ECEA1HS010	Electrolytic 50V 1	1	
C6044		ECKF1H102KB	Ceramic 50V 1000P	1	
C6046		ECQV05334JZ	Mylar 50V 0.33	1	
C6047		ECEA1HS010	Electrolytic 50V 1	1	
C6048		ECEA1CS220	Electrolytic 16V 22	1	
C6049		ECCF1H560KC	Ceramic 50V 56P	1	
C6050,6051		ECEA1HS010	Electrolytic 50V 1	2	
C6052		ECEA1CK100	Electrolytic 16V 10	1	
C6053		ECQV05334JZ	Mylar 50V 0.33	1	
C6054		ECEA1HKR33	Electrolytic 50V 0.33	1	
C6055		ECEA1CK100	Electrolytic 16V 10	1	
C6057		ECEA1HK010	Electroytic 50V 1	1	
C6058		ECEA1HK2R2	Electrolytic 50V 2.2	1	
			Coil		
L6001		VLQ80F470K	47μ	1	
			Resistor Arrays		
RA6001		EXBP86103J	10K x 6	1	
RA6002		EXBP86103K	10K x 6	1	
RA6003		EXBP87103K	10K x 7	1	
RA6004		EXBP84103K	10K x 4	1	
			Crystals		

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
X6001		VSX0082		1	
X6002		VSX0115		1	
			Connectors		
P6001,6002		VJP1232	5P	2	
P6003,6004		VJP1233	6P	2	
P6005		VJP1237	10P	1	
P6006		VJP1235	8P	1	
P6007		VJP1237	10P	1	
P6008		VJP1233	6P	1	
P6009		VJP1232	5P	1	
P6010		VJP1231	4P	1	
P6011		VJP1230	3P	1	
P6012-6014		VJP1229	2P	3	
			Test Terminal		
TP1		VJH23		1	
		VEP04093F	Audio (1) C.B.A.		
			Integrated Circuits		
IC4002		HA12005		1	Ⓡ
IC4006		HA12005		1	Ⓡ
IC4010		AN360		1	Ⓡ
IC4011		μPC4558C		1	or NJM4558D Ⓡ
			Transistors		
Q4002		2SD636		1	(Q,R)
Q4004		2SD636		1	(Q,R)
Q4006		2SD636		1	(Q,R)
Q4008		2SD636		1	(Q,R)
Q4009		2SB643		1	(Q,R,S) Ⓡ
Q4010		2SD655		1	
Q4011-4013		2SD636		3	(Q,R)
Q4014		2SB641		1	(Q,R)
Q4015-4017		2SD636		3	(Q,R)
Q4018		2SD655		1	
Q4019-4021		2SD636		3	(Q,R)
Q4022		2SB641		1	(Q,R)
Q4023-4025		2SD636		3	(Q,R)
Q4046,4047		2SD636		2	(Q,R)
Q4050,4051		2SD636		2	(Q,R)
Q4101		2SB643		1	(Q,R)
Q4110		2SD636		1	(Q,R)
Q4116,4117		2SD636		2	(Q,R)
Q4118,4119		2SB643		2	(Q,R,S)
			Diodes		

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Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
D4005-4008		MA165		4	
D4014,4015		MA165		2	
D4020		MA165		1	
D4038		RD6.2EB	Zener	1	or HA1062M
D4039		MA165		1	
D4043-4046		MA165		4	
D4048,4049		MA165		2	
D4071-4074		MA165		4	
D4086-4091		MA165		6	
D4108-4111		MA165		4	
			Resistors		
R4003		ERDS2TJ562	5.6K	1	
R4004		ERDS2TJ223	22K	1	
R4005		ERDS2TJ272	2.7K	1	
R4006		ERDS2TJ562	5.6K	1	
R4009		ERDS2TJ223	22K	1	
R4010		ERDS2TJ103	10K	1	
R4011		ERDS2TJ222	2.2K	1	
R4014		ERDS2TJ562	5.6K	1	
R4015		ERDS2TJ223	22K	1	
R4016		ERDS2TJ272	2.7K	1	
R4017		ERDS2TJ562	5.6K	1	
R4020		ERDS2TJ223	22K	1	
R4021		ERDS2TJ103	10K	1	
R4022		ERDS2TJ222	2.2K	1	
R4023		ERDS2TJ103	10K	1	
R4024		ERDS2TJ333	33K	1	
R4029		ERD25TJ221	220	1	
R4030		EVN38CA00B53	Variable 5K	1	®
R4031		ERDS2TJ224	220K	1	
R4032		ERDS2TJ102	1K	1	
R4033		EVM38GA00B24	Variable 20K	1	®
R4034		ERDS2TJ103	10K	1	
R4035		ERDS2TJ104	100K	1	
R4036-4038		ERDS2TJ222	2.2K	3	
R4039		ERDS2TJ562	5.6K	1	
R4040		ERDS2TJ103	10K	1	
R4041		ERDS2TJ562	5.6K	1	
R4042		ERDS2TJ102	1K	1	
R4043		ERDS2TJ123	12K	1	
R4051		ERD25TJ154	150K	1	
R4052,4053		ERD25TJ682	6.8K	2	
R4055		ERDS2TJ223	22K	1	
R4056		ERDS2TJ104	100K	1	
R4057		ERDS2TJ223	22K	1	
R4061		ERD25TJ821	820	1	
R4062		ERDS2TJ393	39K	1	
R4065		ERDS2TJ104	100k	1	
R4066		ERDS2TJ102	1K	1	
R4067,4068		ERDS2TJ472	4.7K	2	
R4069		ERD25TJ824	820K	1	
R4070		ERDS2TJ822	8.2K	1	
R4071		ERDS2TJ562	5.6K	1	
R4072		ERDS2TJ333	33K	1	
R4073		ERDS2TJ223	22K	1	
R4078		ERDS2TJ182	1.8K	1	
R4083		ERDS2TJ223	22K	1	
R4084		ERDS2TJ333	33K	1	
R4085		ERDS2TJ103	10K	1	
R4086		EVM38GA00B53	Variable 5K	1	®
R4087		ERDS2TJ183	18K	1	
R4088,4089		ERDS2TJ104	100K	2	
R4090		ERDS2TJ223	22K	1	
R4095		ERDS2TJ822	8.2K	1	
R4096		ERDS2TJ221	220	1	
R4097		ERDS2TJ102	1K	1	
R4106		ERD25TJ221	220	1	
R4107		ERDS2TJ224	220K	1	
R4108		EVN38CA00B53	Variable 5K	1	
R4109		ERDS2TJ102	1K	1	
R4110		EVM38GA00B24	Variable 20K	1	
R4111		ERDS2TJ103	10K	1	
R4112		ERDS2TJ104	100K	1	
R4113-4115		ERDS2TJ222	2.2K	3	
R4117		ERDS2TJ103	10K	1	
R4118		ERDS2TJ562	5.6K	1	
R4120		ERDS2TJ123	12K	1	
R4126		ERD25TJ154	150K	1	
R4128,4129		ERD25TJ682	6.8K	2	
R4131		ERDS2TJ104	100K	1	
R4135		ERD25TJ821	820	1	
R4136		ERDS2TJ393	39K	1	
R4139		ERDS2TJ104	100K	1	
R4140		ERDS2TJ102	1K	1	
R4141,4142		ERDS2TJ472	4.7K	2	
R4143		ERD25TJ824	820K	1	
R4144		ERDS2TJ822	8.2K	1	
R4145		ERDS2TJ562	5.6K	1	
R4146		ERDS2TJ333	33K	1	
R4147		ERDS2TJ223	22K	1	
R4151		ERDS2TJ182	1.8K	1	
R4157		ERDS2TJ223	22K	1	
R4158		ERDS2TJ333	33K	1	
R4159		ERDS2TJ103	10K	1	
R4160		EVM38GA00B53	Variable 5K	1	
R4161		ERDS2TJ104	100K	1	
R4162		ERDS2TJ183	18K	1	
R4163		ERDS2TJ104	100K	1	
R4164		ERDS2TJ223	22K	1	
R4169		ERDS2TJ822	8.2K	1	
R4170		ERDS2TJ221	220	1	
R4171		ERDS2TJ102	1K	1	
R4227		ERDS2TJ103	10K	1	
R4228		ERDS2TJ562	5.6K	1	
R4229		ERDS2TJ103	10K	1	
R4230		ERDS2TJ102	1K	1	
R4231		ERDS2TJ472	4.7K	1	
R4232		ERDS2TJ563	56K	1	
R4233		ERDS2TJ121	120	1	
R4234		ERDS2TJ560	56	1	
R4265-4268		ERDS2TJ103	10K	4	
R4269,4270		ERDS2TJ104	100K	2	
R4273,4274		ERDS2TJ105	1M	2	
R4351,4352		EVM38GA00B25	Variable 200K	2	
R4400		ERDS2TJ103	10K	1	
R4401		ERDS2TJ333	33K	1	
R4423		ERDS2TJ333	33K	1	
R4424		ERDS2TJ103	10K	1	
R4425		ERDS2TJ562	5.6K	1	
R4428		ERDS2TJ103	10K	1	
R4439-4441		ERDS2TJ123	12K	3	
R4442		ERDS2TJ103	10K	1	
R4443		ERDS2TJ333	33K	1	
R4444		ERDS2TJ103	10K	1	
R4445		ERDS2TJ333	33K	1	
R4446		ERDS2TJ223	22K	1	
R4447		ERDS2TJ103	10K	1	
R4448		ERDS2TJ123	12K	1	
R4449		ERDS2TJ103	10K	1	
R4450		ERDS2TJ123	12K	1	
R4451		ERDS2TJ103	10K	1	
R4452		ERDS2TJ223	22K	1	
R4453		ERDS2TJ103	10K	1	
R4454		ERDS2TJ123	12K	1	
R4455		ERDS2TJ103	10K	1	
R4484,4485		ERDS2TJ103	10K	2	
R4486		ERDS2TJ223	22K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R4487		ERDS2TJ103	10K	1	
R4488,4489		ERDS2TJ562	5.6K	2	
			Capacitors		
C4005		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4006		ECKF1H102KB	Ceramic 50v 1000P	1	
C4007		ECEA10M33	Electrolytic 10V 33	1	
C4008		ECQV05393JZ	Mylar 50V 0.039	1	
C4009		ECKF1H102KB	Ceramic 50V 1000P	1	
C4010		ECEA1CS100	Electrolytic 16V 10	1	
C4011		ECEA1HS2R2	Electrolytic 50V 2.2	1	
C4012		ECEA1CS100	Electrolytic 16V 10	1	
C4013-4015		ECQM1H153JZ	Mylar 50V 0.015	3	
C4019		ECKF1H221KB	Ceramic 50V 220P	1	
C4023		ECEA1CSS471	Electrolytic 16V 470	1	
C4024		ECEA1CS101	Electrolytic 16V 100	1	
C4027		ECEA10M33	Electrolytic 10V 33	1	
C4028		ECKF1H102KB	Ceramic 50V 1000P	1	
C4029		ECEA50M1	Electrolytic 50V 1	1	
C4031		ECEA1CN100	Electrolytic 16V 10	1	
C4032		ECEA1HS010	Electrolytic 50V 1	1	
C4033		ECEA1CS100	Electrolytic 16V 10	1	
C4034		ECQM1H273JZ	Mylar 50V 0.027	1	
C4035		ECEA1CS100	Electrolytic 16V 10	1	
C4043		ECEA1CS221	Electrolytic 16V 220	1	
C4050		ECEA50ZR1	Electrolytic 50V 0.1	1	
C4051		ECEA1HS010	Electrolytic 50V 1	1	
C4055		ECQM1H183JZ	Mylar 50V 0.018	1	
C4056		ECEA1CS470	Electrolytic 16V 47	1	
C4058		ECEA1HS010	Electrolytic 50V 1	1	
C4065		ECKF1H221KB	Ceramic 50V 220P	1	
C4066		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4067		ECKF1H102KB	Ceramic 50V 1000P	1	
C4068		ECEA10M33	Electrolytic 10V 33	1	
C4069		ECQV05393JZ	Mylar 50V 0.039	1	
C4070		ECKF1H102KB	Ceramic 50V 1000P	1	
C4071		ECEA1CS100	Electrolytic 16V 10	1	
C4072		ECEA1HS2R2	Electrolytic 50V 2.2	1	
C4073		ECEA1CS100	Electrolytic 16V 10	1	
C4074-4076		ECQM1H153JZ	Mylar 50V 0.015	3	
C4080		ECEA1CSS471	Electrolytic 16V 470	1	
C4083		ECEA1CS101	Electrolytic 16V 100	1	
C4086		ECEA10M33	Electrolytic 10V 33	1	
C4087		ECKF1H102KB	Ceramic 50V 1000P	1	
C4088		ECEA50M1	Electrolytic 50V 1	1	
C4090		ECEA1CN100	Electrolytic 16V 10	1	
C4091,4092		ECEA1CS100	Electrolytic 16V 10	2	
C4093		ECEA1HS010	Electrolytic 50V 1	1	
C4094		ECQV05273JZ	Mylar 50V 0.027	1	
C4105		ECEA50ZR1	Electrolytic 50V 0.1	1	
C4106		ECEA1HS010	Electrolytic 50V 1	1	
C4107		ECEA1CS221	Electrolytic 16V 220	1	
C4113		ECEA1HS010	Electrolytic 50V 1	1	
C4116		ECEA1CS101	Electrolytic 16V 100	1	
C4118		ECQM1H183JZ	Mylar 50V 0.018	1	
C4119		ECEA1CS470	Electrolytic 16V 47	1	
C4161		ECEA1CS330	Electrolytic 16V 33	1	
C4162		ECEA1HS010	Electrolytic 50V 1	1	
C4163		ECEA1CS101	Electrolytic 16V 100	1	
C4164		ECEA1CS330	Electrolytic 16V 33	1	
C4165		ECCF1H330KC	Ceramic 50V 33P	1	
C4166		ECQM1H822KZ	Mylar 50V 8200P	1	
C4167		ECEA1CS101	Electrolytic 16V 100	1	
C4178,4179		ECEA1HS4R7	Electrolytic 50V 4.7	2	
C4307		ECEA50ZR68	Electrolytic 50V 0.68	1	
C4308		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C4309		ECEA1CS100	Electrolytic 16V 10	1	
C4310		ECEA50ZR68	Electrolytic 50V 0.68	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C4311		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C4324,4325		ECEA1ES100	Electrolytic 25V 10	2	
C4328		ECEA1ES100	Electrolytic 25V 10	1	
			Coils		
L4003		VLQ0123		1	Ⓡ
L4005		VLQ80F102K	Choke 1mH	1	Ⓡ
L4006		VLQ0123		1	
			Relays		
RY4001,4002		VSY1015		2	Ⓡ
RY4003		VSY2027		1	Ⓡ
			Connectors		
P4001		VJP1231	4P	1	
P4002,4003		VJP1230	3P	2	
P4004		VJP1233	6P	1	
P4005		VJP1229	2P	1	
			Test Terminals		
TP4001-4004		TJE98101		4	
TP4006		TJE98101		1	
TP GND		TJE98101		1	
			Miscellaneous		
WZBV1		WZBV1	Clamper	3	
		VEP04094F	Audio (2) C.B.A.		
			Integrated Circuits		
IC4003		NE646N		1	Ⓡ
IC4007		NE646N		1	
IC4009		AN6912		1	or μPC339C Ⓡ
IC4012		μPD4066BC		1	Ⓡ
IC4013		NJM4556D		1	Ⓡ
IC4014		μPD4066BC		1	Ⓡ
IC4015,4016		μPC4558C		2	Ⓡ
			Transistors		
Q4045		2SD636		1	(Q,R)
Q4048,4049		2SD636		2	(Q,R)
Q4071,4072		2SD636		2	(Q,R)
Q4073		2SB641		1	(Q,R)
Q4074-4076		2SD655		3	
Q4077		2SD973A		1	(R)
Q4078		2SD636		1	(Q,R)
Q4079		2SD973A		1	(R)
Q4080,4081		2SB643		2	(Q,R,S)
Q4082,4083		2SD655		2	
Q4090		2SD636		1	(Q,R)
Q4100		2SD636		1	(Q,R)
Q4112-4115		2SD636		4	(Q,R)
			Diodes		
D4009		MA165		1	
D4021		MA165		1	
D4063		MA165		1	

Audio (2) C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
D4066,4067		MA165		2	
D4081		MA165		1	
D4098		MA165		1	
D4115,4116		MA165		2	
			Resistors		
R4074,4075		ERDS2TJ102	1K	2	
R4076		ERD25TJ184	180K	1	
R4077		ERDS2TJ274	270K	1	
R4079		ERDS2TJ473	47K	1	
R4080		ERDS2TJ332	3.3K	1	
R4081		ERDS2TJ181	180	1	
R4082		ERDS2TJ102	1K	1	
R4148,4149		ERDS2TJ102	1K	2	
R4150		ERD25TJ184	180K	1	
R4152		ERDS2TJ274	270k	1	
R4153		ERDS2TJ473	47K	1	
R4154		ERDS2TJ332	3.3K	1	
R4155		ERDS2TJ181	180	1	
R4156		ERDS2TJ102	1K	1	
R4217,4218		ERDS2TJ103	10K	2	
R4219		ERDS2TJ564	560K	1	
R4220		ERDS2TJ103	10K	1	
R4221		ERDS2TJ563	56K	1	
R4222,4223		ERDS2TJ103	10K	2	
R4224		ERDS2TJ332	3.3K	1	
R4225		ERDS2TJ105	1M	1	
R4226		ERDS2TJ223	22K	1	
R4235		ERDS2TJ102	1K	1	
R4236		ERDS2TJ474	470K	1	
R4237		ERDS2TJ563	56K	1	
R4238		ERDS2TJ102	1K	1	
R4239,4240		ERDS2TJ223	22K	2	
R4241		ERDS2TJ563	56K	1	
R4242		ERDS2TJ105	1M	1	
R4243		ERDS2TJ103	10K	1	
R4244		ERDS2TJ104	100K	1	
R4245		ERDS2TJ103	10K	1	
R4246		ERDS2TJ332	3.3K	1	
R4247		ERDS2TJ562	5.6K	1	
R4248		ERDS2TJ332	3.3K	1	
R4249		ERDS2TJ103	10K	1	
R4250		ERDS2TJ821	820	1	
R4251		ERDS2TJ560	56	1	
R4252		ERDS2TJ103	10K	1	
R4255		ERDS2TJ332	3.3K	1	
R4256		ERDS2TJ152	1.5K	1	
R4257-4259		ERDS2TJ223	22K	3	
R4263,4264		ERDS2TJ104	100K	2	
R4306		ERDS2TJ393	39K	1	
R4307		ERDS2TJ683	68K	1	
R4310		ERDS2TJ563	56K	1	
R4315		ERDS2TJ223	22K	1	
R4316,4317		ERDS2TJ103	10K	2	
R4318		ERDS2TJ333	33K	1	
R4319		ERDS2TJ102	1K	1	
R4320		ERDS2TJ561	560	1	
R4321		ERDS2TJ470	47	1	
R4327		ERDS2TJ393	39K	1	
R4328		ERDS2TJ683	68K	1	
R4331		ERDS2TJ563	56K	1	
R4336		ERDS2TJ223	22K	1	
R4337,4338		ERDS2TJ103	10K	2	
R4339		ERDS2TJ333	33K	1	
R4340		ERDS2TJ102	1K	1	
R4341		ERDS2TJ561	560	1	
R4342		ERDS2TJ470	47	1	
R4343-4346		ERDS2TJ103	10K	4	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R4347,4348		EVM38GA00B53	Variable 5K	2	
R4349		ERDS2TJ183	18K	1	
R4350		ERD25TJ4R7	4.7	1	
R4353,4354		ERDS2TJ103	10K	2	
R4355		ERD25TJ4R7	4.7	1	
R4356		ERDS2TJ183	18K	1	
R4357		ERDS2TJ332	3.3K	1	
R4358		ERDS2TJ123	12K	1	
R4359		ERDS2TJ104	100K	1	
R4360		ERDS2TJ102	1K	1	
R4361		ERDS2TJ273	27K	1	
R4362		ERDS2TJ221	220	1	
R4363		ERDS2TJ563	56K	1	
R4364		ERDS2TJ104	100K	1	
R4365		ERDS2TJ274	270K	1	
R4366-4368		ERDS2TJ103	10K	3	
R4369		ERDS2TJ102	1K	1	
R4370		ERDS2TJ563	56K	1	
R4371		ERDS2TJ561	560	1	
R4380		ERDS2TJ123	12K	1	
R4381,4382		ERDS2TJ103	10K	2	
R4383,4384		ERDS2TJ102	1K	2	
R4390		ERDS2TJ472	4.7K	1	
R4402		ERDS2TJ103	10K	1	
R4403,4404		ERDS2TJ101	100	2	
R4429		ERDS2TJ333	33K	1	
R4430,4431		ERDS2TJ103	10K	2	
R4432		ERDS2TJ333	33K	1	
R4433,4434		ERDS2TJ103	10K	2	
R4435,4436		ERDS2TJ102	1K	2	
R4498		ERDS2TJ683	68K	1	
R4499		ERDS2TJ103	10K	1	
R4500		ERDS2TJ153	15K	1	
R4501		ERDS2TJ683	68K	1	
R4502		ERDS2TJ103	10K	1	
R4503		ERDS2TJ153	15K	1	
R4506		ERDS2TJ224	220K	1	
R4510		ERDS2TJ103	10K	1	
R4511		ERDS2TJ333	33K	1	
			Capacitors		
C4036		ECEA0JS221	Electrolytic 6.3V 220	1	
C4037		ECEA1CS100	Electrolytic 16V 10	1	
C4038		ECQV05334JZ	Mylar 50V 0.33	1	
C4039		ECQV05104JB	Mylar 50V 0.1	1	
C4040		ECEA1CS100	Electrolytic 16V 10	1	
C4041		ECQV05473JZ	Mylar 50V 0.047	1	
C4042		ECEA1CS101	Electrolytic 16V 100	1	
C4044		ECQM1H472KZ	Mylar 50V 4700P	1	
C4045		ECQV05273JZ	Mylar 50V 0.027	1	
C4046		ECKF1H102KB	Ceramic 50V 1000P	1	
C4047		ECQM1H562KZ	Mylar 50V 5600P	1	
C4048		ECQM1H472KZ	Mylar 50V 4700P	1	
C4049		ECEA1CS100	Electrolytic 16V 10	1	
C4095		ECEA0JS221	Electrolytic 6.3V 220	1	
C4096		ECEA1CS100	Electrolytic 16V 10	1	
C4097		ECQM1H472KZ	Mylar 50V 4700P	1	
C4098		ECQV05273JZ	Mylar 50V 0.027	1	
C4099		ECKF1H102KB	Ceramic 50V 1000P	1	
C4100		ECQM1H562KZ	Mylar 50V 5600P	1	
C4101		ECQM1H472KZ	Mylar 50V 4700P	1	
C4102		ECEA1HS010	Electrolytic 50V 1	1	
C4103		ECEA1CS100	Electrolytic 16V 10	1	
C4104		ECEA1HS010	Electrolytic 50V 1	1	
C4108		ECQV05334JZ	Mylar 50V 0.33	1	
C4109		ECQV05104JB	Mylar 50V 0.1	1	
C4110		ECEA1CS100	Electrolytic 16V 10	1	
C4111		ECQV05473JZ	Mylar 50V 0.047	1	

Front CPU C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C4112		ECEA1CS101	Electrolytic 16V 100	1	
C4160		ECEA1CS330	Electrolytic 16V 33	1	
C4168		ECEA1HN010	Electrolytic 50V 1	1	
C4169		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C4170		ECEA1CS101	Electrolytic 16V 100	1	
C4171		ECEA0JS101	Electrolytic 6.3V 100	1	
C4173		ECEA1HN010	Electrolytic 50V 1	1	
C4174		ECEA1CS101	Electrolytic 16V 100	1	
C4175		ECEA1CS330	Electrolytic 16V 33	1	
C4204		ECEA1CS100	Electrolytic 16V 10	1	
C4206		ECEA1CS100	Electrolytic 16V 10	1	
C4208,4209		ECEA1CS100	Electrolytic 16V 10	2	
C4210		ECEA1CS470	Electrolytic 16V 47	1	
C4211		ECEA1CS101	Electrolytic 16V 100	1	
C4213		ECEA1CS100	Electrolytic 16V 10	1	
C4217		ECEA1CS100	Electrolytic 16V 10	1	
C4219		ECEA1CS100	Electrolytic 16V 10	1	
C4221,4222		ECEA1CS100	Electrolytic 16V 10	2	
C4223		ECEA1CS470	Electrolytic 16V 47	1	
C4224		ECEA1CS101	Electrolytic 16V 100	1	
C4226,4227		ECEA1CS100	Electrolytic 16V 10	2	
C4228		ECQM1H332KZ	Mylar 50V 3300P	1	
C4229		ECQM1H472KZ	Mylar 50V 4700P	1	
C4231,4232		ECKD2H151KB	Ceramic 500V 150P	2	
C4233		ECQF6182KZ	Mylar 630V 1800P	1	
C4234		ECQV05124JZ	Mylar 50V 0.12	1	
C4236		ECQM1H103JZ	Mylar 50V 0.01	1	
C4237		ECQV05333JZ	Mylar 50V 0.033	1	
C4238		ECQM2333KZ	Mylar 200V 0.033	1	
C4239		ECEA1HS010	Electrolytic 50V 1	1	
C4240		ECEA1CS100	Electrolytic 16V 10	1	
C4250		ECEA1HS4R7	Electrolytic 50V 4.7	1	
C4260,4261		ECEA1CS100	Electrolytic 16V 10	2	
C4262,4263		ECEA1CS101	Electrolytic 16V 100	2	
C4301,4302		ECEA1CS470	Electrolytic 16V 47	2	
C4305,4306		ECEA1CS101	Electrolytic 16V 100	2	
C4316,4317		ECEA1CS100	Electrolytic 16V 10	2	
C4342		ECQM1H102JZ	Mylar 50V 1000P	1	
C4343		ECEA1CS470	Electrolytic 16V 47	1	
			Coils		
L4001		VLF0166	Dolby Filter	1	®
L4004		VLF0166	Dolby Filter	1	
L4013		VLQ80F102K	Choke 1mH	1	®
L4021,4022		VLQ80F102K	Choke 1mH	2	
L4023		VLQ24F102K	Choke 1mH	1	
L4024-4027		VLQ80F102K	Choke 1mH	4	
			Transformers		
T4001		VLT0147		1	®
T4002		VLT0118A		1	®
			Relay		
RY4004		VSY2032		1	®
			Connectors		
P4006		VJP1232	5P	1	
P4007,4008		VJP1231	4P	2	
P4009		VJP1230	3P	1	
P4010		VJP1233	6P	1	
P4011,4012		VJP1232	5P	2	
P4013		VJP1230	3P	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
P4014		VJP1232	5P	1	
P4015,4016		VJP1230	3P	2	
			Miscellaneous		
		WZBV1	Clamper	3	
		VEP06189F	Front CPU C.B.A.		
			Integrated Circuit		
IC6201		μPD1511AC022		1	®
			Transistors		
Q6201-6204		2SB643		4	(Q,R)
Q6205		2SD636		1	(Q,R)
Q6206		2SC641		1	
Q6207-6211		2SD636		5	(Q,R)
Q6214		2SD639		1	(Q,R)
Q6215,6216		2SD636		2	(Q,R)
			Diodes		
D6201		MA1051		1	
D6202		MA162		1	
D6203		MA1300	Zener	1	
D6204		MA165		1	
			Resistors		
R6201-6204		ERDS2TJ103	10K	4	
R6205-6208		ERDS2TJ272	2.7K	4	
R6209		ERDS2TJ104	100K	1	
R6210		ERDS2TJ103	10K	1	
R6211-6214		ERDS2TJ472	4.7K	4	
R6215-6218		ERDS2TJ273	27K	4	
R6219		ERDS2TJ472	4.7K	1	
R6220,6221		ERDS2TJ104	100K	2	

Counter C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R6222		ERDS2TJ682	6.8K	1	
R6223		ERDS2TJ330	33	1	
R6236		ERDS2TJ103	10K	1	
R6237,6238		ERDS2TJ104	100K	2	
R6239		ERDS2TJ103	10K	1	
			Capacitors		
C6201,6202		ECCF1H680J	Ceramic 50V 68P	2	
C6204		ECEA0JS470	Electrolytic 6.3V 47	1	
C6205		ECEA1CK100	Electrolytic 16V 10	1	
C6206,6207		ECEA1CS470	Electrolytic 16V 47	2	
C6208		ECQM1H332KZ	Mylar 50V 3300P	1	
C6209		ECQM1H102KZ	Mylar 50V 1000P	1	
C6210		ECEA1HK4R7	Electrolytic 50V 4.7	1	
			Coils		
L6201		VLQ80F470K	Choke 47μH	1	
L6202		VLQ80F102K	Choke 1mH	1	
			Resistor Arrays		
RA6201		EXBP84393K	39K x 4	1	®
RA6202		EXBP84103K	10K x 4	1	®
RA6203		EXBP85103K	10K x 5	1	®
			Switches		
SW6201,6202		ESD14161		2	
SW6205,6206		ESD14161		2	
			Transformer		
T6201		VLT0203A		1	
			Crystal		
X6201		VSX0082		1	
			Connectors		
P6201,6202		VJP1235	8P	2	
P6204		VJP1250	10P	1	
P6205		VJP1248	8P	1	
P6210		VJP1245	5P	1	
P6212		VJP1252	12P	1	
P6213		VJP1248	8P	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VEP00979C1	Counter C.B.A.		
			Integrated Circuits		
IC6301		AN6873N		1	®
IC6302		μPD1512AC023		1	®
IC6303		AN6873N		1	®
			Transistors		
Q6301		2SC641		1	
Q6302,6303		2SD636		2	(Q,R)
			Diodes		
D6301,6302		EBG5504S	LED	2	®
D6303		EBR5504S	LED	1	
D6304		HZ4BLL	Zener	1	
D6305		MA165		1	
			Resistors		
R6301,6302		ERDS2TJ103	10K	2	
R6303		ERDS2TJ104	100K	1	
R6304,6305		ERDS2TJ561	560	2	
R6307-6310		ERDS2TJ103	10K	4	
R6311		ERDS2TJ104	100K	1	
			Capacitors		
C6301,6302		ECCF1H680J	Ceramic 50V 68P	2	
C6303		ECEA0JK470	Electrolytic 6.3V 47	1	
C6304		ECEA0JS470	Electrolytic 6.3V 47	1	
C6305		ECEA1CS100	Electrolytic 16V 10	1	
C6306		ECEA1HS010	Electrolytic 50V 1	1	
			Coil		
L6301		VLQ80F470K	Choke 47μH	1	®
			Resistor Array		
RA6301		EXBP85103K	10K x 5	1	
			Switches		
S6301-6305		EVQQJ104K		5	®
			Crysrtal		
X6301		VSX0082		1	®
			Connectors		
P6301,6302		VJP1235	8P	2	
P6303		VJP1231	4P	1	
P6304		VJP1229	2P	1	

34P Control C.B.A., Hi-Fi Audio C.B.A.

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
		Miscellaneous		
	VGQ0301	FIP Holder	2	
	VMP0314	C.B. Angle	1	
	VMX0469	FIP Spacer	2	
	XTV3+8BFN	Screw	4	
	XZBV1	Clamper	1	
	VMX0473	LED Holder	3	
FL6301	VSL0023	Display Tube	1	Ⓡ
	VEP00982A	34P Control C.B.A.		
		Integrated Circuits		
IC6601	μPD1511AC021		1	Ⓡ
IC6602	HD7406P		1	
		Transistors		
Q6601	2SC641		1	
Q6602-6610	2SD636		9	(Q,R)
		Diodes		
D6601,6602	MA165		2	
		Resistors		
R6601,6602	ERDS2TJ103	10K	2	
R6603	ERDS2TJ104	100K	1	
R6604-6606	ERDS2TJ472	4.7K	3	
R6607-6617	ERDS2TJ103	10K	11	
R6618	ERDS2TJ563	56K	1	
R6619	ERDS2TJ103	10K	1	
R6620	ERDS2TJ104	100K	1	
R6621	ERDS2TJ102	1K	1	
R6622	ERDS2TJ562	5.6K	1	
R6623-6625	ERDS2TJ103	10K	3	
R6626	ERQ12AJ3R9	Metal Fuse 1/2W 3.9	1	
R6627	ERDS2TJ563	56K	1	
R6628	ERDS2TJ153	15K	1	
R6629,6630	ERDS2TJ103	10K	2	

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
R6631-6633	ERDS2TJ104	100K	3	
R6634	ERDS2TJ683	68K	1	
R6635	ERDS2TJ473	47K	1	
R6636	ERDS2TJ102	1K	1	
R6637	ERDS2TJ103	10K	1	
		Capacitors		
C6601	ECEA1CS470	Electrolytic 16V 47	1	
C6603,6604	ECCF1H680J	Ceramic 50V 68P	2	
C6605	ECEA1CS100	Electrolytic 16V 10	1	
C6606	ECEA0JK101	Electrolytic 6.3V 100	1	
C6607	ECEA1HK2R2	Electrolytic 50V 2.2	1	
		Coil		
L6601	VLQ80F470K	Choke 47μH	1	
		Resistor Arrays		
RA6601	EXBP88103K	10K x 8	1	
RA6602	EXBP86103K	10K x 6	1	
		Crystal		
X6601	VSX0082		1	
		Connectors		
P6601	VJP1248	8P	1	
P6602	VJP1252	12P	1	
P6603	VJS1327	34P	1	
	VEP0482B1	Hi-Fi Audio C.B.A.		
		Integrated Circuits		
IC4302	AN6552		1	or μPC4558C Ⓡ
IC4303	μPC4557C		1	Ⓡ
IC4306	AN6391S		1	🅝
IC4309	AN6291S		1	🅝 Ⓡ
IC4310	AN6558		1	🅝 Ⓡ
IC4311	AN6914		1	or μPC393C Ⓡ
IC4314	AN6391S		1	🅝 Ⓡ
IC4315	BA236		1	🅝 Ⓡ
IC4316	AN6320N		1	Ⓡ
		Transistors		
Q4303-4313	2SD636		11	(Q,R,S) or 2SC2021M
Q4317	2SD636		1	(Q,R,S) or 2SC2021M
Q4319,4320	2SD636		2	(Q,R,S) or 2SC2021M
Q4324,4325	2SB641		2	(Q,R,S) or 2SA937M
Q4326	2SD636		1	(Q,R,S) or 2SC2021M
Q4329,4330	2SC2377		2	(B,C)
Q4331	2SD636		1	(Q,R,S) or 2SC2021M
Q4332	2SB641		1	(Q,R,S) or 2SA937M
Q4334	2SD636		1	(Q,R,S) or 2SC2021M
Q4335	2SD638		1	(Q,R,S)
Q4336,4337	2SD636		2	(Q,R,S) or 2SC2021M
Q4338,4339	2SD638		2	(Q,R,S)
Q4340	2SC2377		1	(B,C)
Q4341	2SD636		1	(Q,R,S) or 2SC2021M
Q4342,4343	2SC2377		2	(B,C)
Q4344-4348	2SD636		5	(Q,R,S) or 2SC2021M
Q4349,4350	2SB641		2	(Q,R,S) or 2SA937M
Q4351-4356	2SD636		6	(Q,R,S) or 2SC2021M

Hi-Fi Audio C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
Q4357,4358		2SB641		2	(Q,R)
			Diodes		
D4309-4320		MA165		12	
			Resistors		
R4302,4303		ERDS2TJ122	1.2K	2	
R4313,4314		ERDS2TJ103	10K	2	
R4315		ERDS2TJ473	47K	1	
R4316		ERDS2TJ562	5.6K	1	
R4317,4318		ERDS2TJ473	47K	2	
R4320,4321		ERDS2TJ153	15K	2	
R4322,4323		ERDS2TJ562	5.6K	2	
R4324,4325		ERDS2TJ153	15K	2	
R4330		ERDS2TJ562	5.6K	1	
R4343		ERDS2TJ473	47K	1	
R4348		ERDS2TJ682	6.8K	1	
R4349		ERDS2TJ183	18K	1	
R4350		ERDS2TJ104	100K	1	
R4357		ERDS2TJ563	56K	1	
R4358		ERDS2TJ473	47K	1	
R4359		ERDS2TJ823	82K	1	
R4363		ERDS2TJ103	10K	1	
R4364		ERDS2TJ562	5.6K	1	
R4365		ERDS2TJ392	3.9K	1	
R4366		EVN3ACA00B23	Variable 2K	1	
R4367		ERDS2TJ822	8.2K	1	
R4368		ERDS2TJ153	15K	1	
R4369		EVN3ACA00B13	Variable 1K	1	
R4370		ERDS2TJ102	1K	1	
R4371		EVN3ACA00B13	Variable 1K	1	
R4372		ERDS2TJ562	5.6K	1	
R4374		ERDS2TJ562	5.6K	1	
R4376		ERDS2TJ221	220	1	
R4377		ERDS2TJ471	470	1	
R4378		ERDS2TJ562	5.6K	1	
R4379		ERDS2TJ102	1K	1	
R4380		ERDS2TJ474	470K	1	
R4381		ERDS2TJ332	3.3K	1	
R4382		ERDS2TJ392	3.9K	1	
R4383		ERDS2TJ183	18K	1	
R4384		ERDS2TJ151	150	1	
R4385		ERDS2TJ102	1K	1	
R4386		ERDS2TJ272	2.7K	1	
R4387		ERDS2TJ8R2	8.2	1	
R4388		ERDS2TJ272	2.7K	1	
R4389		ERDS2TJ102	1K	1	
R4390		ERDS2TJ8R2	8.2	1	
R4391		ERDS2TJ152	1.5K	1	
R4393		ERDS2TJ102	1K	1	
R4394		ERDS2TJ682	6.8K	1	
R4395		ERDS2TJ223	22K	1	
R4396		ERDS2TJ102	1K	1	
R4397		ERDS2TJ222	2.2K	1	
R4398		ERDS2TJ561	560	1	
R4399		ERDS2TJ822	8.2K	1	
R4400		ERDS2TJ471	470	1	
R4401		ERDS2TJ222	2.2K	1	
R4402		ERDS2TJ822	8.2K	1	
R4403		ERDS2TJ561	560	1	
R4404		EVN3ACA00B23	Variable 2K	1	
R4405		ERDS2TJ473	47K	1	
R4406		ERDS2TJ100	10	1	
R4407		ERDS2TJ223	22K	1	
R4408,4409		ERDS2TJ102	1K	2	
R4410		ERDS2TJ100	10	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R4411		ERDS2TJ473	47K	1	
R4412		ERDS2TJ124	120K	1	
R4413		ERDS2TJ102	1K	1	
R4414		ERDS2TJ223	22K	1	
R4415		ERDS2TJ392	3.9K	1	
R4416		ERDS2TJ104	100K	1	
R4417		ERDS2TJ221	220	1	
R4418		ERDS2TJ102	1K	1	
R4419		ERDS2TJ331	330	1	
R4420		ERDS2TJ102	1K	1	
R4421		ERDS2TJ392	3.9K	1	
R4422		ERDS2TJ222	2.2K	1	
R4423		ERDS2TJ822	8.2K	1	
R4424,4425		ERDS2TJ182	1.8K	2	
R4427		ERDS2TJ102	1K	1	
R4428		ERDS2TJ392	3.9K	1	
R4429		ERDS2TJ223	22K	1	
R4430		ERDS2TJ104	100K	1	
R4432		ERDS2TJ102	1K	1	
R4433		ERDS2TJ331	330	1	
R4434		ERDS2TJ102	1K	1	
R4435		ERDS2TJ392	3.9K	1	
R4436		ERDS2TJ822	8.2K	1	
R4437		ERDS2TJ222	2.2K	1	
R4438		ERDS2TJ473	47K	1	
R4439		ERDS2TJ102	1K	1	
R4441		ERDS2TJ104	100K	1	
R4442		EVN3ACA00B54	Variable 50K	1	
R4443		ERDS2TJ102	1K	1	
R4444		ERDS2TJ223	22K	1	
R4445		ERDS2TJ473	47K	1	
R4446		ERDS2TJ223	22K	1	
R4447,4448		ERDS2TJ473	47K	2	
R4449		ERDS2TJ123	12K	1	
R4450		ERDS2TJ153	15K	1	
R4451		ERDS2TJ472	4.7K	1	
R4452-4455		ERDS2TJ223	22K	4	
R4456		ERDS2TJ473	47K	1	
R4457		ERDS2TJ222	2.2K	1	
R4458		ERDS2TJ473	47K	1	
R4459		ENV3ACA00B25	Variable 200K	1	
R4461		ERDS2TJ272	2.7K	1	
R4462		ERDS2TJ103	10K	1	
R4463		ERDS2TJ122	1.2K	1	
R4464		ERDS2TJ223	22K	1	
R4465		ERDS2TJ472	4.7K	1	
R4467,4468		EROS2TKG1502	Metal 15K	2	
R4470		ERDS2TJ472	4.7K	1	
R4471		EVN3ACA00B23	Variable 2K	1	
R4472-4476		ERDS2TJ223	22K	5	
R4477,4478		ERDS2TJ473	47K	2	
R4479		ERDS2TJ222	2.2K	1	
R4480		ERDS2TJ472	4.7K	1	
R4481		ERDS2TJ153	15K	1	
R4482		EVN3ACA00B25	Variable 200K	1	
R4484		ERDS2TJ272	2.7K	1	
R4485		ERDS2TJ103	10K	1	
R4486		ERDS2TJ122	1.2K	1	
R4487		ERDS2TJ151	150	1	
R4488		ERDS2TJ472	4.7K	1	
R4489		ERDS2TJ153	15K	1	
R4490		ERDS2TG102	1K	1	
R4491		ERDS2TJ472	4.7K	1	
R4492		ERDS2TJ153	15K	1	
R4493		ERDS2TJ151	150	1	
R4495		ERDS2TJ272	2.7K	1	
R4496		ERDS2TJ151	150	1	
R4497,4498		ERDS2TJ333	33K	2	
R4500		ERDS2TJ272	2.7K	1	
R4501-4504		ERDS2TJ473	47K	4	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R4505		ERDS2TJ122	1.2K	1	
R4506		ERDS2TJ152	1.5K	1	
R4507		ERDS2TJ103	10K	1	
R4508		ERDS2TJ393	39K	1	
R4509		ERDS2TJ104	100K	1	
R4512		ERDS2TJ472	4.7K	1	
R4513		ERDS2TJ562	5.6K	1	
R4514		ERDS2TJ393	39K	1	
R4515		ERDS2TJ223	22K	1	
R4519		ERDS2TJ563	56K	1	
R4520		ERDS2TJ562	5.6K	1	
R4521		ERDS2TJ272	2.7K	1	
R4522		EVN3ACA00B23	Variable 2K	1	
R4527		ERDS2TJ105	1M	1	
R4528		EVN3ACA00B13	Variable 1K	1	
R4529		ERDS2TJ103	10K	1	
R4530		ERDS2TJ183	18K	1	
R4531		ERDS2TJ822	8.2K	1	
R4532		ERDS2TJ153	15K	1	
R4533		ERDS2TJ102	1K	1	
R4534		EVN3ACA00B13	Variable 1K	1	
R4535		ERDS2TJ103	10K	1	
R4539,4540		EVN3ACA00B54	Variable 50K	2	
R4541		ERDS2TJ473	47K	1	
R4542		ERDS2TJ102	1K	1	
R4544		ERDS2TJ102	1K	1	
R4545		EVN3ACA00B54	Variable 50K	1	
R4546		ERDS2TJ104	100K	1	
R4547		ERDS2TJ273	27K	1	
R4548		ERDS2TJ272	2.7K	1	
R4550,4551		ERDS2TJ473	47K	2	
R4552		ERDS2TJ222	2.2K	1	
R4553,4554		ERDS2TJ473	47K	2	
R4555		ERDS2TJ222	2.2K	1	
R4556		ERDS2TJ273	27K	1	
R4557		ERDS2TJ272	2.7K	1	
R4558,4559		ERDS2TJ473	47K	2	
R4560,4561		ERDS2TJ332	3.3K	2	
R4563		ERDS2TJ104	100K	1	
R4565		ERDS2TJ104	100K	1	
R4576,4577		ERDS2TJ822	8.2K	2	
R4580,4581		ERDS2TJ103	10K	2	
R4582		ERDS2TJ222	2.2K	1	
R4583,4584		ERDS2TJ103	10K	2	
R4585		ERDS2TJ222	2.2K	1	
R4586,4587		ERDS2TJ103	10K	2	
R4588		ERDS2TJ222	2.2K	1	
R4589,4590		ERDS2TJ103	10K	2	
R4591		ERDS2TJ222	2.2K	1	
R4592,4593		ERDS2TJ102	1K	2	
R4594,4595		ERDS2TJ223	22K	2	
R4596,4597		ERDS2TJ272	2.7K	2	
R4598,4599		ERDS2TJ273	27K	2	
			Capacitors		
C4303		ECEA1AK470	Electrolytic 10V 47	1	
C4312		ECEA1CK470	Electrolytic 16V 47	1	
C4314,4315		ECEA1CK100	Electrolytic 16V 10	2	
C4316,4317		ECEA1EK3R3	Electrolytic 25V 3.3	2	
C4318		ECEA1CK100	Electrolytic 16V 10	1	
C4320		ECEA1CK100	Electrolytic 16V 10	1	
C4321,4322		ECEA1AK470	Electrolytic 10V 47	2	
C4323		ECEA1CK100	Electrolytic 16V 10	1	
C4325		ECEA1HN010	Electrolytic 50V 1	1	
C4328,4329		ECEA1EK3R3	Electrolytic 25V 3.3	2	
C4331		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4332		ECQB1H103KZ	Mylar 50V 0.01	1	
C4333		ECCF1H101KC	Ceramic 50V 100P	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C4334		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4335		ECCF1H820KC	Ceramic 50V 82P	1	
C4337,4338		ECCF1H680K	Ceramic 50V 68P	2	
C4339		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4340		ECEA1CK100	Electrolytic 16V 10	1	
C4341		ECEA0JK101	Electrolytic 6.3V 100	1	
C4342		ECQB1H562KZ	Mylar 50V 5600P	1	
C4343		ECEA0JK220	Electrolytic 6.3V 22	1	
C4344		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4345		ECKZ1H221KB	Ceramic 50V 220P	1	
C4346		ECEA0JK101	Electrolytic 6.3V 100	1	
C4347		ECKF1H331KB	Ceramic 50V 330P	1	
C4348		ECEA0JK101	Electrolytic 6.3V 100	1	
C4349		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4350		ECQB1H183JZ	Mylar 50V 0.018	1	
C4351		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4352		ECQB1H223JZ	Mylar 50V 0.022	1	
C4353		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4356		ECEA1CK100	Electrolytic 16V 10	1	
C4357		ECQB1H123KZ	Mylar 50V 0.012	1	
C4358		ECCF1H121JC	Ceramic 50V 120P	1	
C4359,4360		ECEA50Z3R3	Electrolytic 50V 3.3	2	
C4361		ECCF1H121JC	Ceramic 50V 120P	1	
C4362		ECQB1H123KZ	Mylar 50V 0.012	1	
C4363		ECEA1CK100	Electrolytic 16V 10	1	
C4364		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4365		ECQB1H183JZ	Mylar 50V 0.018	1	
C4366		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4367		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4368		ECEA0JK101	Electrolytic 6.3V 100	1	
C4369		ECQB1H123JZ	Mylar 50V 0.012	1	
C4370		ECQB1H472JZ	Mylar 50V 4700P	1	
C4371		ECEA1CK100	Electrolytic 16V 10	1	
C4372		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4373		ECEA0JK101	Electrolytic 6.3V 100	1	
C4374		ECQB1H472JZ	Mylar 50V 4700P	1	
C4375		ECQB1H123JZ	Mylar 50V 0.012	1	
C4376,4377		ECEA1CK100	Electrolytic 16V 10P	2	
C4378		ECQB1H223JZ	Mylar 50V 0.022	1	
C4381		ECEA16M10R	Electrolytic 16V 10	1	Ⓝ
C4382		ECEA1CK100	Electrolytic 16V 10	1	
C4383		ECEA1ASS101	Electrolytic 10V 100	1	
C4384		ECEA1CK330	Electrolytic 16V 33	1	
C4385		ECCF1H330KC	Ceramic 50V 33P	1	
C4386		ECEA1AK470	Electrolytic 10V 47	1	
C4387		ECEA0JK330	Electrolytic 6.3V 33	1	
C4388		ECCF1H330KC	Ceramic 50V 33P	1	
C4389		ECEA1CK330	Electrolytic 16V 33	1	
C4390		ECEA1ASS101	Electrolytic 10V 100	1	
C4391		ECQV05473JZ	Mylar 50V 0.047	1	
C4393		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4394		ECEA1CK100	Electrolytic 16V 10	1	
C4395		ECQE05104KZ	Mylar 50V 0.1	1	
C4399,4400		ECEA1EK3R3	Electrolytic 25V 3.3	2	
C4402		ECCF1H101KC	Ceramic 50V 100P	1	
C4403		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4404		ECCF1H820KC	Ceramic 50V 82P	1	
C4405,4406		ECCF1H470KC	Ceramic 50V 47P	2	
C4407		ECQB1H102KZ	Mylar 50V 1000P	1	
C4408		ECEA1EK3R3	Electrolytic 25V 3.3	1	
C4409		ECEA1CK100	Electrolytic 16V 10	1	
C4410		ECEA0JK101	Electrolytic 6.3V 100	1	
C4411		ECQB1H562KZ	Mylar 50V 5600P	1	
C4412		ECEA0JK220	Electrolytic 6.3V 22	1	
C4413		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4414		ECEA0JK101	Electrolytic 6.3V 100	1	
C4415		ECKF1H221KB	Ceramic 50V 220P	1	
C4416		ECKF1H331KB	Ceramic 50V 330P	1	
C4417		ECEA0JK101	Electrolytic 6.3V 100	1	
C4418		ECQP1334GZ	Mylar 100V 0.33	1	Ⓝ

Audio Control C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C4419		ECQP1184GZ	Mylar 100V 0.18	1	🅝
C4420,4421		ECKM1H103ZF	Ceramic 50V 0.01	2	
C4422		ECEA1CK470	Electrolytic 16V 47	1	
C4423		ECCF1H100FC	Ceramic 50V 10P	1	
C4424-4428		ECKM1H103ZF	Ceramic 50V 0.01	5	
C4429		ECEA1CK470	Electrolytic 16V 47	1	
C4430		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4432-4435		ECKM1H103ZF	Ceramic 50V 0.01	4	
C4436		ECEA1CK470	Electrolytic 16V 47	1	
C4437		ECEA1HK010	Electrolytic 50V 1	1	
C4438,4439		ECKM1H103ZF	Ceramic 50V 0.01	2	
C4440		ECEA1HK010	Electrolytic 50V 1	1	
C4441		ECEA1AK330	Electrolytic 10V 33	1	
C4442		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4443,4445		ECEA1CK100	Electrolytic 16V 10	3	
C4446		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4448		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4449		ECCF1H820KC	Ceramic 50V 82P	1	
C4450-4452		ECKM1H103ZF	Ceramic 50V 0.01	3	
C4454,4455		ECKM1H103ZF	Ceramic 50V 0.01	2	
C4456		ECEA1EK4R7	Electrolytic 25V 4.7	1	
C4457,4458		ECKM1H103ZF	Ceramic 50V 0.01	2	
C4461		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4462		ECEA0JK330	Electrolytic 6.3V 33	1	
C4463		ECEA0JK470	Electrolytic 6.3V 47	1	
C4464		ECKM1H103ZF	Ceramic 50V 0.01	1	
C4465,4466		ECCF1H331J	Ceramic 50V 330P	2	
C4467,4468		ECEA1CK100	Electrolytic 16V 10	2	
C4469,4470		ECQB1H222KZ	Mylar 50V 2200P	2	
C4485		ECQM1H102JZ	Mylar 50V 1000P	1	
C4486		ECCF1H391JN	Ceramic 50V 390P	1	
C4487		ECQM1H122JZ	Mylar 50V 1200P	1	
C4488		ECCF1H271JC	Ceramic 50V 270P	1	
C4489		ECQM1H102JZ	Mylar 50V 1000P	1	
C4490		ECCF1H391JN	Ceramic 50V 390P	1	
C4491		ECQM1H122JZ	Mylar 50V 1200P	1	
C4492		ECCF1H271JC	Ceramic 50V 270P	1	
C4493,4494		ECQM1H183JZ	Mylar 50V 0.018	2	
C4495		ECCF1H101KC	Ceramic 50V 100P	1	
C4496,4497		ECEA16M10R	Electrolytic 16V 10	2	🅝
			Coils		
L4301		VLQEL05F121K	Peaking 120μH	1	
L4302		VLQEL05F101K	Peaking 100μH	1	
L4304-4306		VLQEL05F101K	Peaking 100μH	3	
L4307,4308		VLQEL05F3R3K	Peaking 3.3μH	2	
L4309		VLQEL05F330K	Peaking 33μH	1	
L4310-4313		VLQEL05F101K	Peaking 100μH	4	
L4315,4316		VLQEL05F101K	Peaking 100μH	2	
			Filters		
FL4302		VLF0306		1	🅝
FL4304		VLF0306		1	🅝
FL4305		VLF0280		1	🅝
FL4306		VLF0281		1	🅝
			Connectors		
P4301		VJP1233	6P	1	
P4304		VJP1232	5P	1	
P4305		VJP1230	3P	1	
P4306		VJP1229	2P	1	
P4307		VJP1235	8P	1	
P4309		VJP1235	8P	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Test Terminals		
TP4301-4315		VJH0196		15	
			Miscellaneous		
		VSC1020	Shield Case (Top)	1	
		VSC1021	Shield Case (Bottom)	1	
		VMX0469	FIP Spacer	1	
		VMP0407	C.B. Angle (A)	1	🅝
		VMP0408	C.B. Angle (B)	1	🅝
		XTV3+8BFN	Screw	3	
		XWGV0003	Washer	7	
		XYE3+EF8	Screw	1	
		VEP04098A1	Audio Control C.B.A.		
			Integrated Circuits		
IC4101		μPC451C		1	Ⓡ
IC4102		μPC339C		1	Ⓡ
IC4103		μPD4069UBC		1	Ⓡ
IC4104		BA6138		1	🅝 Ⓡ
			Transistors		
Q4101-4106		2SD636		6	(Q,R)
Q4107,4108		2SD636		2	(Q,R)
Q4109,4110		2SD973		2	(Q,R)
Q4111-4118		2SD636		8	(Q,R)
Q4119		2SB643		1	(Q,R)
Q4120		2SD636		1	(Q,R)
Q4121		2SD973		1	(Q,R)
Q4122		2SB819		1	(Q,A,U)
Q4123		2SD630		1	(Q,R)
			Diodes		
D4101-4103		MA165		3	
D4104		RD6.2EB	Zener	1	
D4105		RD5.6EB	Zener	1	
D4106-4119		MA165		14	
			Resistors		
R4101		ERDS2TJ223	22K	1	
R4102		ERDS2TJ331	330	1	

Audio Control C.B.A.

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R4103		ERDS2TJ105	1M	1	
R4104		ERDS2TJ223	22K	1	
R4105		EVN32CA00B14	Variable 10K	1	
R4106,4107		ERDS2TJ104	100K	2	
R4108		ERDS2TJ561	560	1	
R4109-4111		ERDS2TJ104	100K	3	
R4112		EVN32CA00B14	Variable 10K	1	
R4113		ERDS2TJ331	330	1	
R4114		ERDS2TJ105	1M	1	
R4115,4116		ERDS2TJ223	22K	2	
R4117,4118		ERDS2TJ224	220K	2	
R4119		ERDS2TJ333	33K	1	
R4120		ERDS2TJ103	10K	1	
R4121		ERDS2TJ182	1.8K	1	
R4122		ERDS2TJ471	470	1	
R4123,4124		ERDS2TJ562	5.6K	2	
R4125		ERDS2TJ103	10K	1	
R4126		ERDS2TJ333	33K	1	
R4127		ERDS2TJ183	18K	1	
R4128-4130		ERDS2TJ103	10K	3	
R4131		ERDS2TJ222	2.2K	1	
R4132		ERDS2TJ333	33K	1	
R4133,4134		ERDS2TJ103	10K	2	
R4135		ERDS2TJ123	12K	1	
R4136		ERDS2TJ333	33K	1	
R4137		ERDS2TJ473	47K	1	
R4138		ERDS2TJ103	10K	1	
R4139		ERDS2TJ123	12K	1	
R4140		ERDS2TJ473	47K	1	
R4141		ERDS2TJ333	33K	1	
R4142		ERDS2TJ103	10K	1	
R4143		ERDS2TJ105	1M	1	
R4144,4145		ERDS2TJ104	100K	2	
R4146,4147		ERDS2TJ223	22K	2	
R4148		ERDS2TJ152	1.5K	1	
R4149		ERDS2TJ104	100K	1	
R4150		ERDS2TJ102	1K	1	
R4151		ERDS2TJ273	27K	1	
R4152		ERDS2TJ221	220	1	
R4153		ERDS2TJ563	56K	1	
R4154		ERDS2TJ104	100K	1	
R4155		ERDS2TJ274	270K	1	
R4156		ERDS2TJ333	33K	1	
R4157		ERDS2TJ223	22K	1	
R4158		ERDS2TJ103	10K	1	
R4159		ERDS2TJ223	22K	1	
R4160,4161		ERDS2TJ563	56K	2	
R4162		ERDS2TJ223	22K	1	
R4163		ERDS2TJ564	560K	1	
R4164		ERDS2TJ123	12K	1	
R4165		ERDS2TJ104	100K	1	
R4166		ERDS2TJ473	47K	1	
R4167,4168		ERDS2TJ564	560K	2	
R4169		ERDS2TJ103	10K	1	
R4170		ERDS2TJ333	33K	1	
R4171		ERG12ANJ221	220	1	
R4172		ERDS2TJ182	1.8K	1	
R4173		ERDS2TJ103	10K	1	
R4174		ERDS2TJ333	33K	1	
R4175		ERDS2TJ472	4.7K	1	
R4176		ERDS2TJ332	3.3K	1	
R4177		ERDS2TJ562	5.6K	1	
R4178		ERDS2TJ683	68K	1	
R4179-4182		ERDS2TJ103	10K	4	
R4183		ERDS2TJ683	68K	1	
R4184,4185		ERDS2TJ103	10K	2	
R4186		ERDS2TJ333	33K	1	
R4187		ERDS2TJ223	22K	1	
R4188		ERDS2TJ333	33K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Capacitors		
C4101,4102		ECEA1CK100	Electrolytic 16V 10	2	
C4103,4104		ECEA1EK4R7	Electrolytic 25V 4.7	2	
C4105-4107		ECEA1CK330	Electrolytic 16V 33	3	
C4108		ECEA1CK470	Electrolytic 16V 47	1	
C4109		ECEA1CK330	Electrolytic 16V 33	1	
C4110,4111		ECEA1CK100	Electrolytic 16V 10	2	
C4112-4114		ECEA1CK470	Electrolytic 16V 47	3	
C4115		ECEA1CSS101	Electrolytic 16V 100	1	
C4116		ECEA1CK470	Electrolytic 16V 47	1	
C4117		ECKF1H103ZF	Ceramic 50V 0.01	1	
C4118		ECEA1EK4R7	Electrolytic 25V 4.7	1	
C4119		ECEA1HK010	Electrolyitc 50V 1	1	
C4120		ECQV05274JZ	Mylar 50V 0.27	1	
C4121		ECEA1EK4R7	Electrolytic 25V 4.7	1	
C4122		ECEA1CK100	Electrolytic 16V 10	1	
C4123		EFEA1EN4R7	Electrolytic 25V 4.7	1	
C4124		ECEA1CK220	Electrolytic 16V 22	1	
C4125,4126		ECQV05104JB	Mylar 50V 0.1	2	
C4127,4128		ECEA1CK470	Electrolytic 16V 47	2	
			Coil		
L4101		VLQEL06F221K	Peaking 220μH	1	
			Connectors		
P4101,4102		VJP1229	2P	2	
P4103		VJP1232	5P	1	
P4104		VJP1239	12P	1	
P4105		VJP1237	10P	1	
P4106		VJP1233	6P	1	
P4107		VJP1237	10P	1	
P4108		VJP1233	6P	1	
P4109		VJP1232	5P	1	
P4110		VJP1230	3P	1	
			Miscellaneous		
		VMP0406	C.B. Angle	1	Ⓝ
		XTV3+6BFN	Screw	4	
		WZBV1	Clamper	1	

Hi-Fi/Normal Select C.B.A., Audio Pre-Amp C.B.A.

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
	VEP04097A	Hi-Fi/Normal Select C.B.A.		
		Integrated Circuits		
IC4201	μPD4066BC		1	®
IC4202	μPC4558C		1	®
		Transistor		
Q4201	2SD636		1	(Q,R)
		Diode		
D4201	MA165		1	
		Resistors		
R4201	ERDS2TJ102	1K	1	
R4202	ERDS2TJ104	100K	1	
R4203	ERDS2TJ102	1K	1	
R4204	ERDS2TJ563	56K	1	
R4205	ERDS2TJ102	1K	1	
R4206	ERDS2TJ103	10K	1	
R4207	ERDS2TJ333	33K	1	
R4208	ERDS2TJ473	47K	1	
R4209	ERDS2TJ104	100K	1	
R4210-4212	ERDS2TJ473	47K	3	
R4213,4214	ERDS2TJ104	100K	2	
R4215,4216	ERDS2TJ473	47K	2	
R4217,4218	ERDS2TJ102	1K	2	
		Capacitors		
C4201,4202	ECEA1CK470	Electrolytic 16V 47	2	
C4203-4208	ECEA1CK100	Electrolytic 16v 10	6	
C4209	ECEA1CK470	Electrolytic 16V 47	1	
		Connectors		
P4201,4202	VJP1233	6P	2	
P4203	VJP1231	4P	1	
P4204	VJP1229	2P	1	

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
	VEP04099A1	Audio Pre-Amp C.B.A.		
		Integrated Circuits		
IC4401,4402	μPC4558C		2	®
		Transistor		
Q4401	2SD636		1	(Q,R)
		Resistors		
R4401,4402	ERDS2TJ102	1K	2	
R4403	EVN32CA00B14	Variable 10K	1	
R4404,4405	ERDS2TJ154	150K	2	
R4406,4407	EVN32CA00B14	Variable 10K	2	
R4408,4409	ERDS2TJ154	150K	2	
R4410	EVN32CA00B14	Variable 10K	1	
R4411-4413	ERDS2TJ473	47K	3	
R4415	ERDS2TJ182	1.8K	1	
		Capacitors		
C4401	ECEA1CK470	Electrolytic 16V 47	1	
C4402,4403	ECEA1CK100	Electrolytic 16V 10	2	
C4404,4405	ECEA1CK330	Electrolytic 16V 33	2	
C4406,4407	ECEA1CK100	Electrolytic 16V 10	2	
C4408,4409	ECEA1CK330	Electrolytic 16V 33	2	
C4410,4411	ECEA1CK470	Electrolytic 16V 47	2	
C4412	ECEA1CSS101	Electrolytic 16V 100	1	
C4413	ECEA1CK470	Electrolytic 16V 47	1	
		Connectors		
P4401	VJP1248	8P	1	
P4402	VJP1244	4P	1	
P4403	VJP1242	2P	1	
P4404	VJP1244	4P	1	
		Miscellaneous		
	XTV3+6BFN	Screw	2	

Left Control Panel C.B., Rear Jack C.B.A., Front Jack C.B., Audio VR C.B.

Ref. No.		Part No.	Part Name & Description		Pcs / Set	Remarks
		VJB00B52	Left Control Panel C.B.			
			Resistor			
R6543		ERDS2TJ393		39K	1	
			Connectors			
P6541		VJP1250		10P	1	
P6542		VJP1150			1	
P6543-1		VJP1232		5P	1	
P6543-2		VJP1233		6P	1	
P6544		VJP1244		4P	1	
P6545		VJP1245		5P	1	
P6546		VJP1246		6P	1	
			Lamps			
PL6541,6542		VLL0019			2	
			Switches			
S6541		ESB641			1	
S6542-6544		USS0072			3	
		VEP00B58A	Rear Jack C.B.A.			
			Transistors			
Q6661,6662		2SD636			2	(Q,R)
			Diodes			
D6661-6665		MA165			5	
D6667-6675		MA165			9	
			Resistors			
R6661		ERDS2TJ103		10K	1	
R6662		ERDS2TJ472		4.7K	1	
R6663-6665		ERDS2TJ103		10K	3	
R6666		ERDS2TJ750		75	1	
R6667		ERDS2TJ823		82K	1	
R6668		ERDS2TJ103		10K	1	
R6669		ERDS2TJ273		27K	1	
R6670,6671		ERDS2TJ563		56K	2	
R6673		ERDS2TJ561		560	1	
R6674,6675		ERDS2TJ750		75	2	
R6676		ERDS2TJ103		10K	1	
R6678		ERDS2TJ103		10K	1	
R6679		ERDS2TJ750		75	1	
			Connectors			
P6661		VJP1252		12P	1	
P6662		VJP1244		4P	1	
P6663		VJP1248		8P	1	
P6664		VJP1244		4P	1	

Ref. No.		Part No.	Part Name & Description		Pcs / Set	Remarks
P6665		VJP1245		5P	1	
P6666		VJP1246		6P	1	
P6667		VJP1243		3P	1	
P6668		VJP1244		4P	1	
			Switches			
SW6663,6664		VES0244			2	
			Miscellaneous			
J6667,6668		VJJ0083	Phono Jack with Switch		2	
		VJB00978	Front Jack C.B.			
			Resistors			
R6577,6578		ERDS2TJ121		120	2	
R6579,6580		ERDS2TJ563		56K	2	
			Connectors			
P6561		VJP1243		3P	1	
P6562,6563		VJP1244		4P	2	
P6564		VJP1245		5P	1	
		VJB00B53	Audio VR C.B.			
			Resistors			
R6761,6762		EWGANAS93B14	Variable	10K	2	⊘
			Connectors			
P6764,6765		VJP1235		8P	2	

Small Circuit Boards

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJB00B29	Hour Meter C.B.		
			Resistors		
R6701		ERDS2TJ474	470K	1	
R6702		ERDS2TJ273	27K	1	
R6703		ERDS2TJ332	3.3K	1	
			Connector		
P6763		VJP1242	2P	1	
			Miscellaneous		
		VSE0036	Hour Meter 5000H	1	®
		TJC6319	Fuse Holder	2	
		VJB00B30	Fan Motor Connection C.B.		
			Transistors		
Q6767,6768		2SD639		2	(Q,R)
			Resistors		
R6715		ERDS2TJ222	2.2K	1	
R6716		ERDS2TJ103	10K	1	
R6717		ERDS2TJ563	56K	1	
			Connectors		
P6761		VJP1243	3P	1	
P6762		VJP1242	2P	1	
		VJB00B31	Hi-Fi Audio Out C.B.		
			Transistors		
Q6764,6765		2SD655		2	
			Resistors		
R6711,6712		ERDS2TJ103	10K	2	
R6713,6714		ERDS2TJ102	1K	2	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Connector		
P6762		VJP1245	5P	1	
			Miscellaneous		
J6761		VJJ0081	Phone Jack 2P	1	
		QJT0015	Rag	1	
		VJB00B79	20kHz LPF (A) C.B.		
			Transistors		
Q4353,4354		2SD636		2	(S) or 2SC2021M (S,T)
Q4357		2SB641		1	(Q,R)
			Resistors		
R4586,4587		ERDS2TJ103	10K	2	
R4588		ERDS2TJ222	2.2K	1	
R4589,4590		ERDS2TJ103	10K	2	
R4591		ERDS2TJ222	2.2K	1	
R4596		ERDS2TJ272	2.7K	1	
			Capacitors		
C4489		ECQM1H102JZ	Mylar 50V 1000P	1	
C4490		ECCF1H391JN	Ceramic 50V 390P	1	
C4491		ECQM1H122JZ	Mylar 50V 1200P	1	
C4492		ECCF1H271JC	Ceramic 50V 270P	1	
		VJB00B80	20kHz LPF (B) C.B.		
			Transistors		
Q4351,4352		2SD636		2	(S) or 2SC2021M (S,T)
Q4358		2SB641		1	(Q,R)
			Resistors		
R4580,4581		ERDS2TJ103	10K	2	
R4582		ERDS2TJ222	2.2K	1	
R4583,4584		ERDS2TJ103	10K	2	
R4585		ERDS2TJ222	2.2K	1	
R4597		ERDS2TJ272	2.7K	1	
			Capacitors		
C4485		ECQM1H102JZ	Mylar 50V 1000P	1	
C4486		ECCF1H391JC	Ceramic 50V 390P	1	
C4487		ECQM1H122JZ	Mylar 50V 1200P	1	
C4488		ECCF1H271JC	Ceramic 50V 270P	1	

Small Circuit Boards

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJB00B81	Pre-Emphasis C.B.		
			Transistors		
Q4355,4356		2SD636		2	(Q,R,S,T) or 2SC2-21M (S)
			Resistors		
R4495		ERDS2TJ272	2.7K	1	
R4500		ERDS2TJ272	2.7K	1	
R4592,4593		ERDS2TJ102	1K	2	
R4594,4595		ERDS2TJ223	22K	2	
			Capacitors		
C4493,4494		ECQM1H183JZ	Mylar 50V 0.0018	2	
		VJB00A41	Mechanism Connection C.B.		
			Connectors		
P6704		VJP1250	10P	1	
P6705		VJP1242	2P	1	
P6707		VJP1242	2P	1	
P6708		VJP1244	4P	1	
			Miscellaneous		
		VMA6059	C.B. Angle	1	
		VJH0196	Test Terminal	3	
		XTV3+6F	Screw	3	
		VJB00A06	Front Loading Motor Connection C.B.		
			Connectors		
P6751		VJP1245	5P	1	
P6752,6753		VJP1242	2P	2	
		XTV3+6F	Screw		

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJB00A40	Front Connection C.B.		
			Connectors		
P6801,6802		VJP1229	2P	2	
P6803		VJP1233	6P	1	
P6811,6812		VJP1229	2P	2	
P6813		VJP1233	6P	1	
		VJB00A05	Lamp C.B.		
PL6751,6752		VLL0019	Lamp	2	
		VJB00931	Reel Sensor C.B.		
IC6701,6702		DN6838A	Hall IC	2	
			Sensor LED C.B.		
D6701,6702		LN58	LED	2	
		VMD0145	LED Holder	1	
		VMA4785	LED Holder Angle	1	
		XSS26+4	Screw	1	
		VJB00636	Supply Photo TR C.B.		
Q1504S		PN150NV	Photo TR	1	®
C6701S		ECKF1H102KB	Ceramic 50V 1000P	1	

Small Circuit Boards

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJB00636	Take-up Photo TR C.B.		
Q1504T		PN150NV	Photo TR	1	®
C6701T		ECKF1H102KB	Ceramic 50V 1000P	1	
		VJB00A19	Power & Reel Drive TR C.B.		
Q6401		2SD1268	Power Tr	1	® ⚠
Q6402		2SD1265	Reel Drive Tr	1	® ⚠
		VSC0984	Heat Sink	1	
		N018	Insulation Sheet	2	
		N024B	Insulation Tube	2	
		XTV3+8BFN	Screw	4	
		ESB9473	Key Board Unit		
			Diodes		
D1-4		LN29RCPP	LED RED	4	
D7,8		LN29RCPP	LED RED	2	
D12		LN49YCPP	LED YELLOW	1	
D13,14		LN39GCPP	LED GREEN	2	
DK1-4		MA154WA	Twin Diode	4	
			Resistors		
R1-4		ERD25TJ221	220	4	
R7,8		ERD25TJ221	220	4	
R12-14		ERD25TJ101	100	3	
			Switches		
SW1-4		EVQQS107K		4	
SW7,8		EVQQS107K		2	
			Miscellaneous		
		KL02	LED Spacer	9	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJB00A72	A/C Head C.B.		
		ERDS2TJ100	Resistor 10	2	
		VJP1244	Connector	1	